

DOCUMENT RESUME

ED 278 544

SE 047 708

AUTHOR Shaw, Carol M.; Underiner, Tamara L.
TITLE Bringing Career Education into Math and Science Classrooms: Sex Equitable Strategies.
INSTITUTION Dayton Univ., Ohio.
SPONS AGENCY Ohio State Dept. of Education, Columbus. Div. of Vocational Education.
PUB DATE 83
NOTE 192p.; Prepared at the School of Engineering. Drawings may not reproduce well.
AVAILABLE FROM School of Engineering, University of Dayton, 300 College Park, Dayton, OH 45469-0001 (\$8.00).
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052) -- Tests/Evaluation Instruments (160)
EDRS PRICE MF01/PC08 Plus Postage.
DESCRIPTORS Career Choice; *Career Education; High Schools; Learning Strategies; Mathematics Education; Mathematics Instruction; Nontraditional Occupations; *Science Careers; Science Education; *Science Instruction; Scientists; Secondary School Mathematics; *Secondary School Science; Sex Bias; *Sex Fairness; *Teaching Methods

ABSTRACT

Designed for the use of high school personnel, especially mathematics and science teachers, this manual provides ideas and mechanisms that will help reduce inappropriate career decisions based on emotions, sex role stereotyping, and misinformation. Contents include sections which focus on: (1) where the jobs are in science and engineering; (2) teacher's influence on students' choices (strategies for encouraging nontraditional careers); (3) five role models for teachers and students; (4) career navigation paradigm (helping students chart their careers); (5) the industrial connection; (6) the university as a resource; (7) the community as a career education resource; (8) a total career education model; (9) students journeying toward a technological future; and (10) a bibliography categorized by articles, books, directories, ERIC documents, pamphlets, periodicals/proceedings, and vocational books/articles. (ML)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED278544

Bringing Career Education into Math and Science Classrooms



SEX EQUITABLE STRATEGIES

Carol M. Shaw
University of Dayton

with
Tamara L. Underiner

BEST COPY AVAILABLE

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as
received from the person or organization
originating it.
☐ Minor changes have been made to improve
reproduction quality.

• Points of view or opinions stated in this docu-
ment do not necessarily represent official
OERI position or policy.

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

Carol M. Shaw

Shaw

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

Bringing Career Education into
Math and Science Classrooms:
SEX EQUITABLE STRATEGIES

CAROL M. SHAW
Assistant Dean of Engineering
University of Dayton

With
TAMARA L. UNDERINER
Staff Assistant

Maureen Cronin Masters
Project Editor

Reviewed by

David L. Boggs, Ph.D.
The Ohio State University

University of Dayton

1983

This project was provided through a grant of the Ohio Department of Education, Division of Vocational Education, Office of Sex Equity. It is in compliance with Title VI, Title IX, the Handicapped Act of 1973, and Education Amendments of 1976. These materials do not reflect official policy or opinion of the United States Department of Education or the Ohio Department of Education.

Cover design by

Bob Brown

Layout by

Teresa S. Bohlander

Typography by

Susan C. Traister

ACKNOWLEDGEMENTS

- Cherry, Nancy Cook. "Developing Students' Personal Career Planning Skills" and "Researching Career Options." (1982)
- Daniels, Jane. "Women in Engineering/Purdue." (1982).
- Egan, Eugene R. "Chemistry and the Navigation Paradigm." (1981).
- Farris, C.J. "Changing Work Force and Family Quiz." (1978).
- Flavin, Robert. "Mathematics and the Navigation Paradigm." (1981).
- Guisewite, Cathy. "Cathy." April 11, 1977 and January 22, 1981.
- Hymowitz, Carol. "More Men Infiltrating Professions Historically Dominated by Women." The Wall Street Journal. February 25, 1981.
- Pelphrey, Sheila. "The Engineering and Science Careers Program: A Student's View." (1982).
- Project Awareness. Training program addressing sex discrimination issues in education. Office of the Superintendent of Public Instruction and Feminists Northwest, Olympia, Washington, 1981.
- Rechin, Bill and Don Wilder. "Crock." January 6, 1981.
- Schumacher, Howard. "Physics and the Navigation Paradigm." (1981).
- Schumeister, James. "Levy's Law." December 4, 1980.
- Seltz-Petrash, Ann. "Wise Words from a Woman Engineer." Graduating Engineer. September/October 1980.
- Slater, Shirley, June Varner, and Carolyn Quattrocki. "Classroom Checklist." (1978).
- Tombaugh, Dorothy, Interview: "Science for the Handicapped Student." February, 1983.

BRINGING CAREER EDUCATION INTO MATH AND SCIENCE CLASSROOMS:
SEX EQUITABLE STRATEGIES

CONTENTS

	<u>Page</u>
PREFACE	
INTRODUCTION: How Science and Mathematics Teachers Can Help Meet the Career Education Challenge	1
1. WHERE THE JOBS ARE	4
A. Data from the Scientific and Engineering Commission: A Classroom Presentation	4
B. Science and Engineering Areas for the Next Decade: Issues	7
C. The U.S. Department of Labor Source	12
2. TEACHERS' INFLUENCE ON STUDENTS' CHOICES: STRATEGIES FOR ENCOURAGING NONTRADITIONAL CAREERS	20
A. Awareness-Raising Activities	24
1. Surveys to Examine Attitudes	24
2. Questionnaires to Evaluate Your School	38
3. Checklists and Questionnaires to Assess Your Own Teaching Materials and Procedures	40
B. Passing Sex Equity Awareness on to Students: Mechanisms to Turn Awareness Into Action	50
1. Discussion Examples that Focus on Sex Equity	51
2. Developing Students' Personal Career Planning Skills	59
3. Other Ideas for Classroom and After-School Activities	65
3. FIVE ROLE MODELS FOR TEACHERS AND STUDENTS	68
A. "Focus On Carol Haag: Welder-to-Be"	70
B. "Observations from an Engineer (Who Happens to be a Woman)"	75
C. "Career Education for Minorities: Special Strategies (An Interview with Associate Professor Grace Mitchell)"	80
D. "Wise Words from a Woman Engineer" (An Interview with Lilie Abron-Washington)	86
E. "Science for the Handicapped Student" (An interview with Dorothy Tombaugh)	89

	<u>Page</u>
4. THE CAREER NAVIGATION PARADIGM: HELP STUDENTS CHART THEIR CAREERS	93
A. General Discussion of the Career Compass and the Career Navigation Paradigm	93
B. Mathematics and the Navigation Paradigm	97
C. Chemistry and the Navigation Paradigm	101
D. Physics and the Navigatiton Paradigm	104
E. How to Expand the Navigation Paradigm: Initiate a Panel Discussion	107
5. THE INDUSTRIAL CONNECTION	112
A. General Discussion	112
B. Utilizing Industry: Model Programs	116
1. A Day With Industry	116
2. The Industry Roundtable	119
3. Organized Approaches by Industry to Provide Career Education	120
a. The Massachusetts High Technology Council	120
b. Summer Science Student Program	122
c. Engineering and Science Careers Program	124
d. The Engineering and Science Careers Program: A Student's View	126
6. THE UNIVERSITY AS A RESOURCE: THE UNIVERSITY OF DAYTON/PURDUE RESPONSE	127
A. General Discussion	127
B. The Purdue Women in Engineering Career Day	129
C. The Women in Engineering Seminar/Institute (UD)	131
D. Student Science Training Program (SST, UD)	134
E. Women in Engineering Seminar (Purdue)	136
7. YOUR COMMUNITY AS A CAREER EDUCATION RESOURCE	141
A. The Honor Seminars Series: A Comprehensive Community Volunteer Program	142
B. Professional Societies as a Resource for Career Education and Sex Equity	144
C. Computer Files on Career Information	150
D. The Community College and Career Education: Dayton's Sinclair Community College as a Model	154

	<u>Page</u>
8. A TOTAL CAREER EDUCATION MODEL: THE DAYTON CAREER ACADEMY	160
9. YOUR STUDENTS: JOURNEYING TOWARD A TECHNOLOGICAL FUTURE	169
10. BIBLIOGRAPHY	171

Preface

I wish to thank all those professional and clerical assistants who worked on this manual. Through their efforts and insights we were able to expand our own horizons on the issues of sex equity and career education and discover a variety of ways these issues might be incorporated into classroom discussion/work. A special note of thanks to those authors mentioned in the "Acknowledgements" section who took precious hours of their own time to provide their experience and views on sex equity issues.

The State Department of Education Sex Equity and Career Education coordinators, Carol Whitney and Karen Shylo, deserve recognition for their insight and support in funding the project. I also extend appreciation to James Gilbert, Career Education Coordinator, Montgomery County Joint Vocational School, for helping conceive and inspire the project.

Special thanks to Tammy Underiner for her contribution in doing the research and for her assistance in writing many of the early outlines and drafts; to Maureen Masters for her work in editing and revising the subsequent drafts; to Susan Traister for typesetting the original manuscript; and to Teresa Bohlander for typesetting and arranging the final printing. A final note of gratitude to David Boggs, Ph.D., Professor of Adult Education, The Ohio State University, for reviewing the manuscript and suggesting valuable revisions. Some readers may feel that the issues raised in this manual have been discussed and resolved over the past decade, that there is really no need for another book on the subjects of sex or career equity. While it is true that laws involving this issue have been researched, discussed, legislated, and made the subject of many speeches, articles, and books, by no means have all the problems been satisfactorily resolved for the young women and men currently in high school.

A review of current trends indicates that women and men are now entering fields once reserved for a single sex (i.e. women are entering engineering and men are entering nursing). Samuel Ehrenhalt, Commissioner of Labor Statistics for the Middle Atlantic region points out that the focus on sex and career equity solutions has shifted, but the problems have not lessened: In the 1970s the barriers needed to be broken down. In the 1980s the problems will be with promotions and pay scales. The New York Times writer, Frank Prial, quotes Sally Steenland of the Center for Women and Work on the gains made by women in male-dominated professions: "There is quite a lot of evidence, both researched and anecdotal, showing that when women enter any job category or profession in droves, that occupation loses status. Men don't want it anymore, and the salaries become lower. It happened to bank tellers in recent years, when women took that job over, and it happened a century ago when the male clerk was replaced by the female secretary." In short, as women develop careers rather than hold down jobs thus increasing their status and length of time in the work force, they will continue to encounter obstacles in their demand for justice in pay and promotions. According to Ehrenhalt, "In the past women were glad enough to have the job. A nurse with 20 years' experience made about the same as a nurse starting out. There was no concept of a career ladder, but there is now." Teachers need to learn ways to assist young women to acquire the assertiveness and competencies needed to climb that ladder.

Time (July 12, 1982) analyzed some of the same data and more in a cover story devoted to American women taking stock and stepping up the pace of work equity. The article, "How Long Till Equality?" provided statistics in a "Hoorah" and "Boo" pattern: 301 women state legislators in 1969, 908 in 1981 (Hoorah!) BUT those 908 legislators are only 12% of the members of state legislative bodies (Boo!). The major writer, Jay Cocks, comments, "The numbers mark distance traveled and distance yet to go." He continues, "Eighty percent of all women who work hold down 'pink collar jobs' and get paid about \$.66 of a man's dollar. Seventy percent of all classroom teachers are women, yet for the same job, they make an average of \$3,000 a year less than their male colleagues. More than a third of all candidates for the M.B.A. degrees are women: the numbers encourage. Only 5% of the executives in the top 50 American companies are women: the numbers numb."

Time's article quotes one woman: "I thought how unpleasant it is to be locked out; and I thought how it is worse perhaps to be locked in." It is the nation's high school teachers who hold one of the keys that will allow young women to pass in and out of career doors at will. It is to those adults working with these young women as they educate themselves, as they choose courses, as they select majors, that this manual is written. It may help students to realize that by choosing a strong high school program of mathematics and science courses they will be in a better position to obtain career equity as well as combat scientific illiteracy. Philip M. Boffey, science and career writer for The New York Times, was describing new programs designed to combat the growing scientific illiteracy of our citizens when he wrote that "foundations, government agencies, and professional societies have all pointed to an alarming decline in scientific and technical competence among the general public. Women as well as men will have to prepare themselves to make wise choices in everyday life, to perform effectively on the job, to vote and carry out civic responsibilities, and to exercise political leadership." All of these competencies should be held by today's students, but, instead the truth is that college students take less science than their parents before them, secondary students are dropping out of science early in their high school careers, science and mathematics achievement scores have been declining since 1970, and industry and military employers complain that new recruits cannot perform in jobs that require technical understanding.

Technological literacy rates must increase for both women and men if we expect legislators to understand the complexities of technical issues, ranging from nuclear safety to chemical food additives to advanced military equipment. Professional careers also require high technological literacy rates: lawyers must handle pollution cases, theologians must advise on genetic problems, and managers must realize the implications of computer science. Now it is one thing to encourage students to stick with mathematics and science courses in order to prepare for careers in those fields, but now teachers must also show all students that the future is theirs only if they become technologically literate. (Since September, 1981, when Harvard began requiring that all undergraduates learn to write a short computer program, many institutions of higher learning have followed suit.)

As Time's writers remind us: "Biology is immutable. Basic physical differences will not change, but the law will. Absolute equality between men and women may be impossible—absolutes are—but it is approachable at least, and now just a little closer." Those who counsel young women as they seek their path in life can help to define the future and show how to cope with the challenges that are brought about by the changing roles of women. It is to assist with this vital task that this book was written.

— C.M.S.
Dayton, Ohio
June 1983

INTRODUCTION

HOW SCIENCE AND MATH TEACHERS CAN HELP MEET THE CAREER EDUCATION CHALLENGE



"If we defined all roles as human roles...we could ask humans to display their humanity."

Warren Farrell

Newspaper headlines, employment statistics, and futurists' predictions all indicate a world-wide need for technically trained people throughout the 1980's and beyond. Problems in energy, food, housing, and waste disposal are waiting for future scientists and engineers to develop creative and cost-effective solutions. Solving the problems facing our technological society makes increasing the supply of scientists a paramount concern to educators. So that those future challenges can be met, teachers need to encourage students to explore careers in science, mathematics, and engineering. To meet this goal, all students need more awareness of technological careers; and because women and minorities have been under represented in these careers, it is important for teachers to find creative ways to stimulate them to participate fully in the potentially rewarding technological future. School systems must find innovative ways to encourage students to contribute to a world with an ever-increasing technological emphasis.

How Our School Systems Can Respond

Teachers are a key factor in influencing the career choices of our future scientists, engineers, and technologists. To successfully meet the challenge of producing the quality and quantity of scientific personnel to fill projected demands, science and math teachers must play a new and expanded role in education; they must not only teach theory in their science, mathematics, and vocational courses, but they must help students to set educational, careers, and life goals for themselves. This goal-setting will, of course, involve students in getting as much information as possible about various careers and jobs. Students will need to know which jobs will be in demand during the coming decades, what the job requirements and duties will be, what the chances for advancement will be, and what kind of a lifestyle would be possible within each job or career choice.

Science and mathematics teachers are the crucial link between students and the courses that act as "critical filters" for future careers in science, engineering, and technology. Teachers can enhance science and mathematics education by making career education an integral part of all classroom work. Relating subject areas to the real world of work will add

a new and meaningful dimension to students' traditional perceptions of the material they study. Motivation will increase as students see the connection between classroom information and career decisions. In addition, teachers may find that their classroom presentations are enriched and their work loads lessened as they take advantage of business, industry, and government resources to help provide a bridge to real-world applications.

If career education is also brought into the classroom in a sex-equitable manner, it will help to motivate women and minorities, traditionally under-represented in science and engineering, to broaden their career choices. This effort will ensure that we make use of all the talent and brainpower our country has to offer.

The lack of a concerted effort by schools to incorporate career education in the classroom has often meant that vital career information has been disseminated through more informal and haphazard means. This informal process has had a devastatingly negative effect in terms of achieving sex equity in the technological work force—it has relegated the 51 percent of our population who are women to careers considered suitably feminine—teaching, social work, dietetics, librarianship, and nursing. These statistics lead one to wonder how many problem-solvers, scientists, engineers, and skilled workers have been lost to our society.

The basic premise of this manual is that a concerted, formal process of career education by classroom teachers using a variety of pedagogical methods can combat informational careering processes—processes that produce inappropriate career decisions based on emotions, sex role stereotyping, and misinformation.

Objectives of This Career Education/Sex Equity Manual

This manual is for those persons (particularly science and math teachers) who work with high school students on a daily basis. The manual provides ideas and mechanisms that will help integrate career education into standard course presentations; discusses career education modules which utilize resources from local industries, universities, professional societies and community organizations; presents data on current job and salary information that can be used for classroom discussion; and contains suggestions for student handouts.

Many of the program ideas here can be accomplished in the typical fifty-minute class period. Programs cooperatively offered with a university or professional society may be planned after school in conjunction with science clubs; as all-day, school-sponsored events; or as weekday, weekend, or summer learning experiences. Many of the programming ideas have been tested and evaluated and can be adapted to your situation with minor variations. Sample evaluation questionnaires that may be adapted to your curriculum are also included.

Some of the sections of this manual will be of interest to schoolwide personnel—to counselors and administrators as well as to teachers. Others are more specifically usable by teachers of mathematics and science. For anyone interested in educating young people for life-long career development, this manual will be an invaluable resource guide.

Finally, don't let your imagination be limited to the suggestions in this manual. There is a world of resources waiting for you and your students. This manual can lead you to them; it is up to you and your students to explore them.

WHERE THE JOBS ARE



"'His' and 'hers' should not divide a world which is 'ours'."
Mary Calderone

A. Data From the Scientific Manpower Commission: A Classroom Presentation

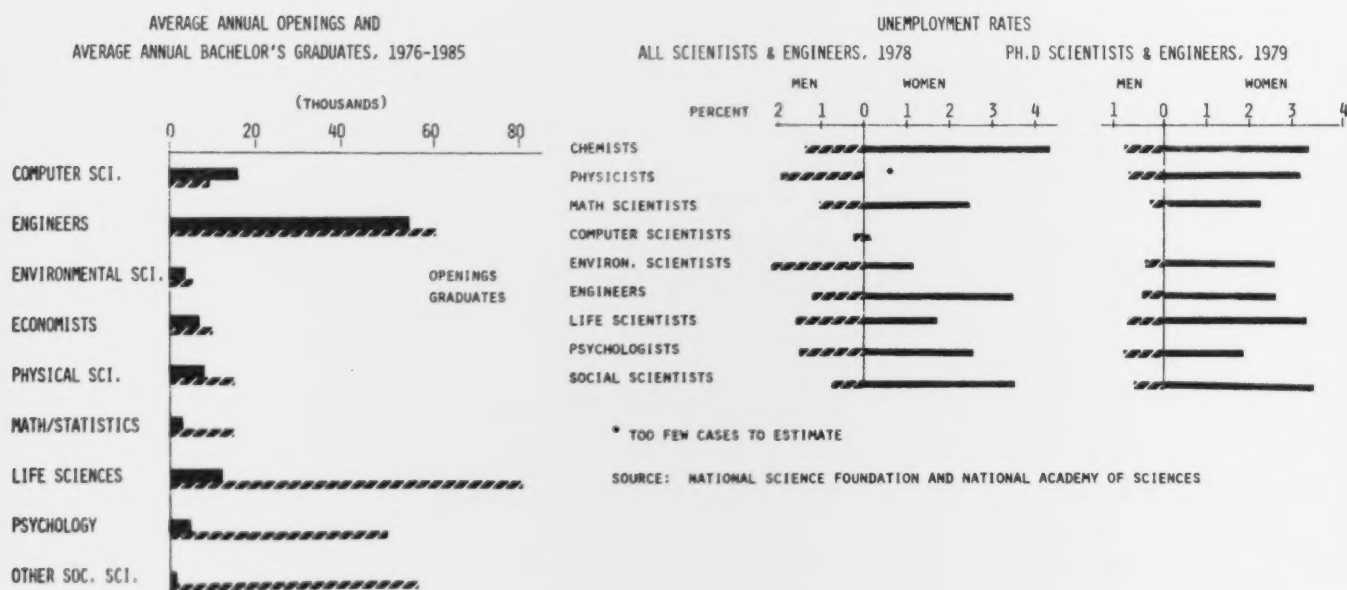
We recommend first introducing sex equitable career education into the classroom by relating it to what generally interests students most—information about jobs and salaries.

This chapter contains an overview of the current employment and salary outlooks for the physical sciences, engineering, social sciences, life sciences, mathematics, computer science, and engineering technology. Such information is crucial for both high school guidance counselors and teachers if they are to clarify information for students already interested in science or mathematics or to motivate students who have yet to explore the possibilities of a mathematics or science program.

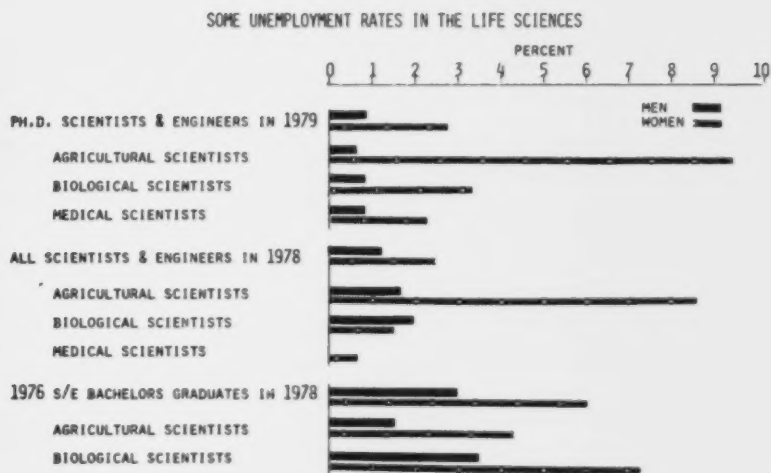
The Scientific Manpower Commission (SMC), Washington, D.C., provides pertinent career information in slide/tape form which can be used to present and discuss average annual openings, salaries, and unemployment rates in the sciences and engineering. To reserve a copy of SMC's latest chartbook of data, contact The Scientific Manpower Commission at 1776 Massachusetts Ave., N.W., Washington, D.C 20036. Other valuable publications by The Commission include Supply and Demand for Scientists and Engineers, Professional Women and Minorities, A Manpower Data Resource Service, and Manpower Comments. Copies of these publications should be in your school library. The slide/tape presentation also summarizes current statistics for students as another way of achieving sex equity awareness. A look at the job opportunities in the coming decade for both men and women reveals the career areas where the opportunities for women appear to be greater. Women should, for example, think carefully about entering an already over-populated career field.

- o **Physical Sciences:** Chemistry, geology, and physics openings will roughly equal the number of graduates in these areas.

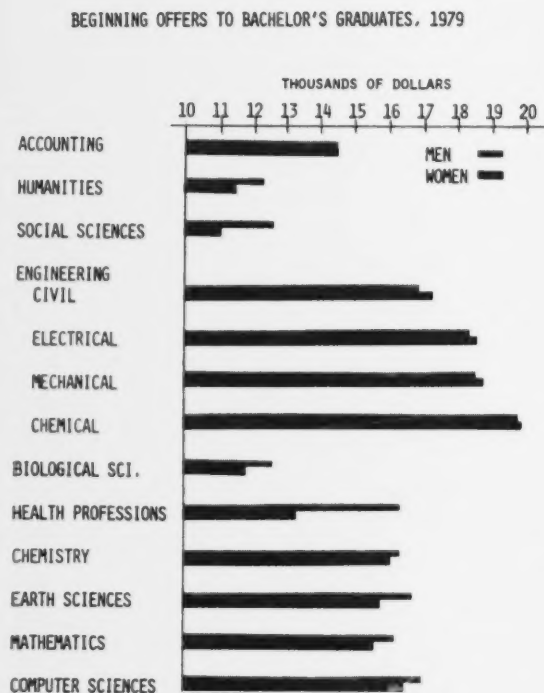
Figure 1.A Data from the Scientific Manpower Commission



SOURCE: U.S. DEPARTMENT OF LABOR, BUREAU OF LABOR STATISTICS



SOURCES: NATIONAL ACADEMY OF SCIENCES AND NATIONAL SCIENCE FOUNDATION



SOURCE: COLLEGE PLACEMENT COUNCIL

Reprinted with Permission

o **Engineering and Computer Sciences:** In general, the demand for all types of engineers is expected to remain high. The demand for female engineers has been and will probably continue to be high, with salary levels fully competitive with those offered to men at the bachelor's level. The demand for bachelor-level computer scientists is expected to outstrip the number of graduates in that field.

o **Life Sciences:** The number of bachelor's level graduates with degrees in the life sciences (biological, agricultural, and health/medical) will exceed the number of openings in those areas. Starting salaries in the life sciences will also be significantly lower than in fields such as engineering.

o **Behavioral/Social Sciences:** With the exception of economics, the behavioral and social sciences (psychology, anthropology, sociology, and political science) will provide fewer opportunities than the number of graduates expected. Most openings will require advanced degrees. In economics, the high demand for advanced-degree specialists may open up opportunities for those with bachelor's degrees.

It is also important to provide students with accurate career information regarding any salary differences or other job inequities. See Figure 1.A for several discussion starters in this area. At present, salary discrepancies between men and women exist in most fields:

o In humanities, social sciences, life sciences, and physical and natural sciences, men command higher starting salaries than do women. These gaps widen with years of experience and higher degree levels.

o In most engineering fields, women command slightly higher starting salaries than do men. However, with equal on-the-job experience and the same advanced degrees, men quickly surpass their female peers in both salaries and promotions. The 1982 data show women receiving 101.3% of the salaries offered to men, down from 102.7% in 1976. In some fields (e.g., oil and petroleum engineering and all engineering technology), women's offers were below men's in 1981.

o Only in accounting do men and women earn the same starting salaries.

Counselors and teachers should emphasize that the changing job scene demands not only specialization in a college major, but also learning and/or sharpening basic skills (writing, reading comprehension, oral communications) to increase employment opportunities. And because the computer is fast becoming an integral part of most employing organizations, computer and data processing skills are a decided advantage in the job market. Students should understand, however, that to choose a major field of study based solely on the job market in that field would be unwise. Not only must students have an understanding of potential employment opportunities and a recognition that job situations can change, but they must also know themselves, their strengths, weaknesses, and personal preferences, in order to make an informed career choice. An understanding of potential employment opportunities and a recognition that job situations can change are crucial to making an informed choice of careers. A good education in any field should help to prepare for all careers and career changes.

B. Science and Engineering Employment Areas for the Next Decade: Issues for Women

For the next decade all predictions indicate a strong demand for technically trained people in many areas. In the dissemination of sex and race equitable career information to students, be sure to indicate the "career boom" areas for the next ten years—science, engineering, and engineering technology. Ask students to be on the lookout for resource materials which illustrate current job trends. Consider, for example, the following article:

THE CHRONICLE OF HIGHER EDUCATION

June 29, 1981

7-Pct. Increase in Jobs for Graduates Foreseen

BETHLEHEM, PA.

Businesses expect to hire 7 per cent more college and university graduates this year than they did last year, according to the College Placement Council. Demand for engineering graduates—up 10 per cent from last year—is strongest, the council says, while that for liberal-arts and social-science majors is down by 4 per cent.

Job opportunities for science, mathematics, and other technical graduates will increase by about 6 per cent, employers told the council, and those for business majors will grow at the same rate.

The placement council based its re-

port on an April survey of 513 private-sector employers.

Breaking down the figures by types of employers, the council predicts that companies in the fields of banking, finance, insurance, chemicals, and pharmaceuticals will be employing fewer college graduates, but that others will increase their hiring.

Oil companies will hire about 24 per cent more graduates in all fields. Construction-related industries will hire 19 per cent more, virtually all of them engineers. Metal-products companies will employ about 17 per cent more graduates in the engineering, scientific, and business fields. Electrical-

equipment, glass, paper, packaging, and tire and rubber companies will also be hiring at strong levels.

The council notes that the federal job market is expected to remain sluggish. Openings for bachelor's-degree recipients are expected to rise by 1 per cent, but opportunities for those with master's degrees are expected to drop by 11 per cent. The government will be hiring both engineers and internal-revenue agents, the council says.

Business recruiters expect to conduct about 1 per cent fewer on-campus interviews next year, the council says.

—LAWRENCE BIEMILLER

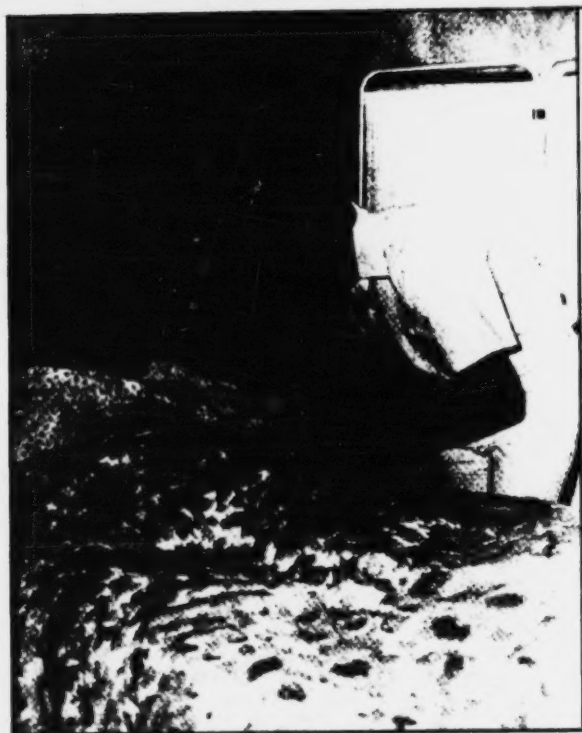
(Reprinted with permission.)
18



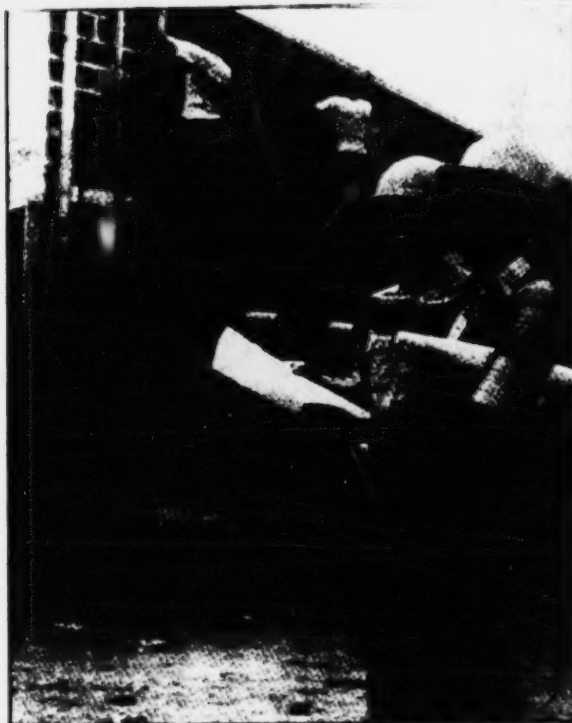
Technically speaking, she's no rough draft.



Dave's key to a \$12,000 a year job.



Two years ago Bob thought an LPN was for his stereo, now he is one.



Home sweet home...and she's in charge of building it!

FOR MORE INFORMATION ON VOCATIONAL CAREERS CONTACT:
Ohio Department of Education, Division of Vocational Education
or talk to your vocational counselor in your school.

Several disciplines within the career boom areas of science, engineering, and engineering technology are just beginning to open up for women. In order to interest women students in these areas, review the historical participation of women in these fields while indicating to students such information as anticipated salaries and number of predicted openings. This approach will provide both sexes with an appreciation for the way society has changed its perceptions of different career areas and the roles of men and women in them.

The growth in enrollment of women in the non-traditional career area of engineering has, for example, increased from less than one percent in 1974 to 24 percent in 1982 at the University of Dayton. This growth also parallels a national trend. However, the percentage of women enrolling in engineering (20 percent of many freshmen engineering classes) is only now beginning to approach the percentage of women who have historically gone into various areas of science: mathematics, chemistry, and physics. Students need to realize that, in spite of these rather large percentages of previous science graduates and the predicted growth in engineering graduates, women still represent only a small percentage of the employees within the science and engineering work force.

Tables and charts that describe the historical patterns of the participation of men and women in various career fields can illustrate these trends to students and act as a springboard for discussions regarding general career opportunities in various fields, sex-stereotyped career areas, and the prerequisites for different career areas within science and engineering. The charts in figure 1.B (which follow) indicate that historically women have not shied away from technical career fields such as chemistry, mathematics, and biology; e.g., for the last twenty years women have been thirty to forty percent of the mathematics majors. Ask students to suggest reasons for the low enrollment of women in engineering during this same period.

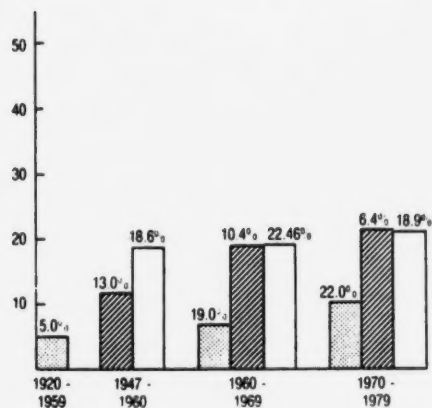
Through such a discussion students may themselves come to recognize certain societal factors, such as sex role conditioning, which have operated to influence the career decisions of men and women. Students may suggest that engineering conveys a "male image" and that this image dissuaded many women from selecting engineering as a career. A general discussion of which careers students see as being sex-stereotyped may lead to an increased awareness of how sex-role conditioning affects career choice. (Handouts and discussion materials in Chapter 2 may assist class analysis of this phenomenon.)

Figure 1.B Data from the Scientific Manpower Commission

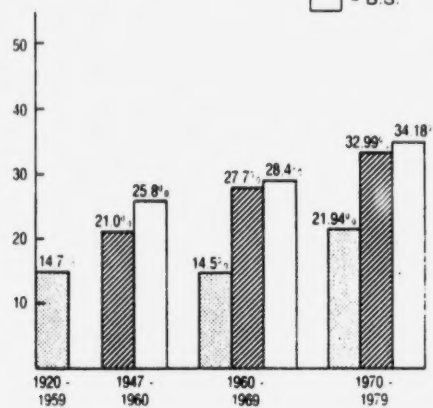
Percentages of Degree Recipients Who Are Women in Science, Mathematics, and Engineering — 1929-1979.

□ = Ph.D.
 ▨ = M.S.
 □ = B.S.

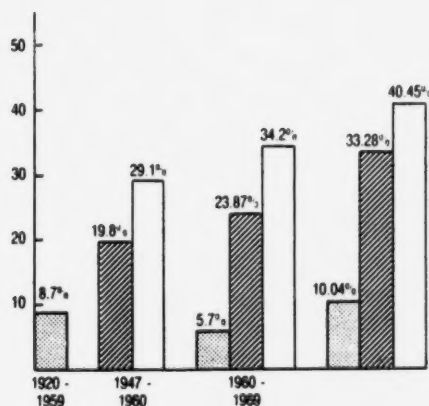
CHEMISTRY



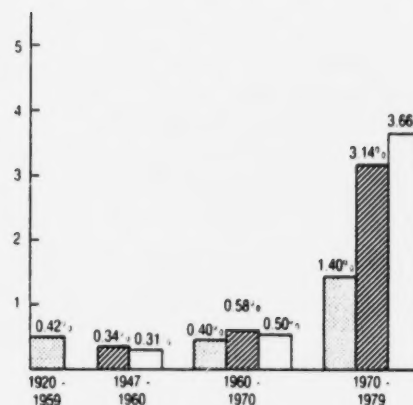
BIOLOGY



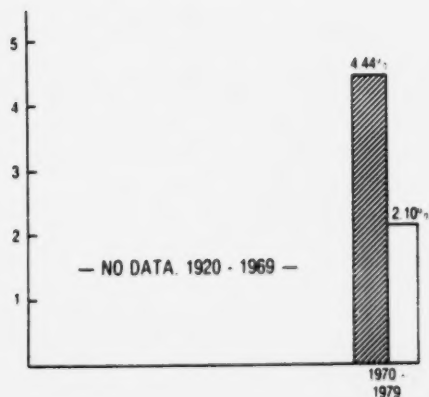
MATHEMATICS



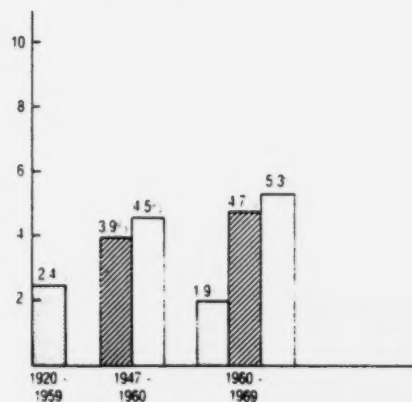
ENGINEERING



ENGINEERING TECHNOLOGY



PHYSICS



Students may also suggest that women are more likely to pursue science and mathematics as opposed to engineering because they do not perceive themselves to be as "hands-on" or equipment-oriented as their male counterparts. This interpretation of the data in Figure 1.B suggests that traditionally women have chosen theoretical rather than applied career areas. Further verification of this phenomena occurs when the percentage of women enrolling in engineering is compared to the percentage of women enrolling in engineering technology. Growth in the more "hands on" or applied areas of engineering technology has not been as dramatic as growth in the more theoretical areas of engineering. This information can serve as motivation for further in-class discussions or to focus on the need for career programs which address the psychological fears of entering non-traditional career areas. Programs and panel discussions can be used to illuminate and counter these psychological factors which still operate to influence career choices of men and women (see Chapters 5, 6, and 7).

Discussion of the percentages of women enrolling in various disciplines within science and engineering, as indicated in Figure 1.B., may lead to further questions about the distinctions between science and engineering careers. As you discuss the career areas of science and engineering with your students, emphasize the basic difference in the approaches to problem solving for these two areas. The scientist pursues the discovery of knowledge by designing and carrying out experiments that yield reproducible results. The scientist uses a predictive approach to problem solving—the scientific method—and is usually pushing at the frontiers of knowledge. The length of a given study (one month or several years) and its cost are often secondary considerations when compared to the importance of a scientific breakthrough. Consider cancer research, for example—the time and costs involved are unimportant when a breakthrough results.

The engineer also uses the scientific method, but in a different way—to find applications for known scientific principles. There is generally more than one approach to solving engineering problems, which exist in the real world and must be solved within the constraints of time and budgets. Rather than dealing with controlled experiments, as does the scientist, the engineer will usually proceed from a set of assumptions to the solution. A good engineer is often judged by how accurately these assumptions produce an economically viable solution.

If students wish to measure their career interests in science and engineering, ask them to consider which of these statements best describes them:

- (1) I am most comfortable when I can solve an open-ended technical problem and get the best answer in the shortest amount of time.
- (2) I am most comfortable when I can solve a technical problem, with a specific research design, in great detail with time not being a factor.
- (3) I am most comfortable when I can solve problems that deal with people rather than technical material.

Choice of number 1 indicates a personal inclination suitable for a career in engineering; number 2 more appropriately defines a scientist; and number 3 overlaps both areas but points to careers that involve a strong interaction with people, such as sales or marketing.

The data in Figure 1.B. may also facilitate a discussion of science and engineering opportunities in terms of their prerequisite academic preparation. Further questions may be raised about whether the different degree requirements for science and engineering have special implications for women. The data indicates that the bachelor's degree, often a requirement for entry-level positions, may not always be sufficient for long-term career advancement. For many science areas the career goal is research; although there are openings for B.S. and M.S. personnel, the Ph.D. is considered the terminal degree and a definite requirement for career advancement. Although engineers can do research and teach in institutions of higher education, career areas that require a Ph.D., most engineers work in industry or as consultants. A four-year bachelor's degree in engineering is still the accepted preparation for the majority of technical jobs in government and industry.

Students may notice that the data comparing the percentages of men and women going to graduate school indicates that fewer women have persisted in seeking graduate degrees. Students may realize that it is the classic struggle between the extended demands of graduate school and the obligations of family life that causes women to drop out. In the context of the discussion point out that, although engineering has been nontraditional for women, the options for career advancement with a bachelor's degree (still considered viable for engineering) have some positive attractions. For women interested in science, indicate that this information should not be perceived negatively, but rather incorporated positively into long-range career planning.

The problem of when and how to schedule interruptions of technical careers to raise a family may be a natural follow-up to the discussion of long-term commitments to graduate education. If students show an interest in finding solutions for this problem, suggest the following strategies: active membership in professional societies, part-time employment, job sharing, and keeping abreast of new developments by reading technical publications and maintaining a professional network. Teachers who are aware of these issues and prepared to discuss them become important factors in motivating students to pursue science, engineering, or engineering technology careers.

C. The U.S. Department of Labor as a Resource

Teachers who want to augment the information from the Scientific Manpower Commission and Table 1.B with additional statistics on jobs, job openings, and the workers who fill them, will find useful information available from the U.S. Department of Labor. As publisher of hundreds of pamphlets, brochures, and handbooks for career seekers of all ages, this agency can be an invaluable aid in educating high school students about their future career possibilities.

The Department of Labor's regional offices for the Midwest are located in Chicago. Agencies of interest to high school teachers would be:

U.S. Department of Labor
Bureau of Labor Statistics
230 South Dearborn Street
Ninth Floor, Federal Building
Chicago, IL 60604
(312) 353-1880
Regional Commissioner:
William E. Rice

U.S. Department of Labor
Employment & Training Administration
230 South Dearborn Street
Sixth Floor, Federal Building
Chicago, IL 60604
(312) 353-0313

U.S. Department of Labor
Women's Bureau
230 South Dearborn Street
Eighth Floor, Federal Building
Chicago, IL 60604
(312) 353-6985

U.S. Department of Labor
Bureau of Apprenticeship &
Training
230 South Dearborn Street
Fourth Floor, Federal Building
Chicago, IL 60604
(312) 353-0785

A wealth of literature is available by contacting these agencies; single copies are usually provided at no cost, while bulk orders may require a nominal fee. Also available are films, videotapes, and slide presentations on various subjects of interest to career-minded students (see resource list which follows).

The Occupational Outlook Handbook and the Occupational Outlook Quarterly, both published by the U.S. Department of Labor, and available in school libraries and guidance centers, continue to be among the best compendiums of job and career information. The former contains listings, descriptions, and availability of hundreds of job titles, and provides information on the training requisite for these positions. The Occupational Outlook Quarterly is the Department of Labor's career magazine; in it are articles which analyze recent and current trends in employment and updates on job opportunities. Both of these publications are a crucial first step for anyone researching career options. The following four tables indicate the range of resources available from the U.S. Department of Labor.

TABLE I

Bureau of Labor Statistics Publications

Apprenticeship Now. Reprint from Summer 1978,
Occupational Outlook Quarterly. 19 pp.
Single copies free.

Getting Chosen: The Job Interview and Before.
Reprint from Spring 1979, Occupational Outlook Quarterly. 9 pp.

The Job Outlook in Brief. Reprint from Spring 1980, Occupational Outlook Quarterly. 21 pp.

The Job Outlook for College Graduates Through 1990. Reprint from Winter 1979, Occupational Outlook Quarterly. 7 pp.

Matching Personal and Job Characteristics. Reprint from Fall 1978, Occupational Outlook Quarterly. 15 pp.

Jobs for Which You Can Qualify If You're not a High School Graduate. 12 pp. Single copies free.

Jobs for Which You Can Train Through Apprenticeship. 8 pp. Single copies free.

Jobs for Which You Probably Will Need Some College or Specialized Training. 12 pp. Single copies free.

Jobs for Which You Probably Will Need a College Education. 14 pp. Single copies free.

Occupational Outlook Handbook. \$8.00.

Payoffs and Payments: The Economics of a College Education. Reprint from Summer 1977, Occupational Outlook Quarterly.

Order from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

TABLE 2

Employment & Training Administration Publications

Apprenticeship: Past and Present. 1977. 27 pp.

Apprenticeship Training in the 1970s: Report of a Conference.
Manpower Research Monograph No. 37, 1974. 100 pp.

Apprenticeship Training: Sure Way to a Skilled Craft.
1974. 8 pp.

Dual Careers. Longitudinal Analysis of the Labor Market Experience
of Women (Four Volumes). 1970, 1973, 1974, 1975.

Job Title Revisions to Eliminate Sex and Age Referent Language
from the Dictionary of Occupational Titles. 1975. 363 pp.

Merchandising Your Job Talents. 1974. 24 pp.

The National Apprenticeship Program. 1976. 41 pp.

Placing Minority Women in Professional Jobs. R & D Monograph
No. 55, 1978. 75 pp.

Training and Entry Into Union Construction. R & D Monograph
No. 39, 1975. 217 pp.

WIN Training Manual. Increasing Job Options for Women by
Nontraditional Job Placement. 1975.

Women and Work. R & D Monograph No. 46. 1977. 71 pp.

Women in Apprenticeship - Why Not? R & D Monograph No. 33,
1974. 71 pp. 75 cents.

Women in Traditionally Male Jobs: The Experiences of Ten
Public Utility Companies. R & D Monograph No. 65, 1978.
136 pp. \$3.25.

TABLE 3

Women's Bureau Publications

Better Jobs for Women. Model YWCA project originally funded by CETA to recruit and place women in skilled job training or apprenticeship programs. 1978. 60 pp.

Brief Highlights of Major Federal Laws and Order on Sex Discrimination in Employment. 1978. 6 pp.

The Earnings Gap Between Women and Men. 1976. 12 pp. 35 cents.

Fully Employed Women Continue to Earn Less Than Fully Employed Men. Chart. 1979.

Increasing Job Options for Women: A Conference Guide. "How-to" guide for planning and holding a conference with employers, unions, women's groups, and individuals on nontraditional jobs for women. 32 pp.

Most Women Work Because of Economic Need. Chart. 1979.

New Regulations to Help Open Nontraditional Jobs to Women. Information leaflet on Department of Labor's new regulations on equal employment opportunity for minorities and women in the construction industry and in apprenticeship. 1978. 2 pp.

1975 Handbook on Women Workers. 1975. 435 pp. \$4.75.

Nontraditional Occupations Program for Women. Model of the CETA funded project of the same name sponsored by the Boston YWCA, which has trained women for skilled blue-collar jobs. 1978. 79 pp.

Sex Stereotyping: Its Decline in the Skilled Trades. Reprint from May 1974, Monthly Labor Review.

TABLE 3

Women's Bureau Publications (Continued)

Sources of Assistance in Recruiting Women for Apprenticeship Programs and Skilled Nontraditional Blue-Collar Work. National, state, and local sources of information and programs grouped by the Department of Labor's ten regions. 1978.

State Labor Laws in Transition: From Protection to Equal Status for Women. 1976. 20 pp. 35 cents.

Steps to Improve Employment Opportunities for Women in Blue-Collar Occupations. 1979.

Trends in Women's Employment and Training in Selected Professions. 1976. 4 pp.

20 Facts on Women Workers. 1980. 3 pp.

A Woman's Guide to Apprenticeship. An overview of women in apprenticeship and information about the apprenticeship system, the barriers that inhibit women's participation, and the application process. 1978. 24 pp.

Women Are Underrepresented as Managers and Skilled Craft Workers. Chart. 1979.

Working with Employers to Develop Jobs: A Workshop Model. "How-to" guide for planning and holding a workshop with employers to increase placement of women in nontraditional jobs. 1978. 20 pp.

Note: The Women's Bureau distributes single copies of its publications free of charge. Multiple copies of those for which prices are given may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. All Women's Bureau materials are in the public domain and may be reproduced without permission.

TABLE 4

Audio-Visual Presentations

SLIDES

Looking Ahead to a Career. Bureau of Labor Statistics, U.S. Department of Labor. 53 statistical slides about occupations and employment trends.

Slide-Tape Series:

Expanding Job Options for Women. Shows women working in a variety of nontraditional jobs and reviews employer responsibility for equal opportunity and affirmative action. (NAC#007846, \$26.25, 10 minutes).

Legal Responsibilities - Affirmative Action and Equal Employment. Illustrates legal responsibilities of employers to eliminate unfair and illegal employment practices that often affect women. (NAC#007848, \$26.25, 12 minutes).

The Legal Rights of Women Workers. Explains women's rights to equal employment opportunity, equal training and promotion opportunity, and equal pay. (NAC#007847, \$23.25, 6 minutes).

Order from:

Order Section
National Audio Visual Center (NAC)
General Services Administration
Washington, D.C. 20409

(They may be borrowed from any of the 10 regional offices of the Women's Bureau.)

TABLE 4

Audio-Visual Presentations (Continued)

FILMS

The Apprentice. Bureau of Apprenticeship and Training, Employment and Training Administration, U.S. Department of Labor, 601 D Street, NW, Washington, D.C. 20213. General film giving history, current status, and reality of apprenticeship. Interviews women and men apprentices on the job. (26 minutes, color). Available on loan from BAT regional office.

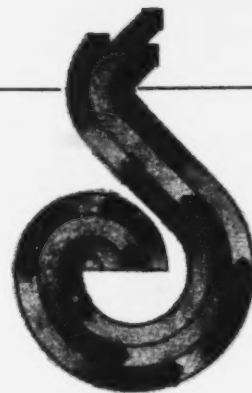
Farewell to Welfare. Media Resource Center, Employment and Training Administration, Room 5113, 601 D Street, NW, Washington, D.C. 20213, (202) 376-7298. Interviews with three WIN women, a truck driver, picture framer-manager, and machine operator, and their employers (30 minutes, color).

New Perspectives of Women in Nontraditional Jobs. Media Resource Center. Employment and Training Administration, Room 5413, 601 D Street NW, Washington D.C. 20213, (202) 376-7298. Interviews with two women, a bus-driver and a shipbuilder, about how they got their jobs and how they feel about them.

The Only Way To Go Is Up. Media Resource Center. Employment and Training Administration, Room 5413, 601 D Street, NW, Washington, D.C. 20213, (202) 376-7298. Documentary on Atlanta's Minority Women Employment Program's successful efforts to place under-utilized college educated women in managerial, professional, and technical jobs. (30 minutes, videotape).

The Sky's the Limit. Bureau of Apprenticeship and Training Employment and Training Administration, U.S. Department of Labor, 601 D Street NW, Washington, D.C. 20213, (202) 376-6106. Apprenticeship agency/employer/union information film depicting women apprentices in nontraditional jobs. (25 minutes, color). Available on loan from the BAT regional office.

TEACHERS' INFLUENCE ON STUDENTS' CHOICES: STRATEGIES FOR ENCOURAGING NONTRADITIONAL CAREERS



"Let's use the intellect: Ideas have no sex or race."
Carol M. Shaw

Classroom teachers have a great deal of influence over students' career choices—perhaps even more than do parents and counselors. To successfully promote sex equity in career decision-making, it is important to recognize this impact and be impartial in what is taught, implicitly and explicitly, about work and sex roles. As classroom techniques become more sex-equitable, more women and men will choose nontraditional careers. Perhaps these efforts will be positively reflected in future statistics from The Scientific Manpower Commission and the Department of Labor.

This chapter provides mechanisms to achieve a deeper awareness of sex equity issues. This "consciousness-raising" can be seen as a two-part process: 1) *Sharpening your own awareness and the awareness of your colleagues about sex-equity issues*, and 2) *Passing this awareness on to your students*. When this two-part process is successful, productive dialogue between classroom teacher and student about career goals becomes possible.

To begin the process, ask your class to define "sex equity." Amanda Smith and Charlotte Farris, pioneers in the field of presentation methods to achieve sex equity, define it as "freedom from favoritism based on sex."

In follow-up discussions emphasize that certain attitudes toward roles in the workplace are even more important if the choice of a nontraditional career is involved—men as nurses or secretaries, for example, or women as engineers or carpenters. The article "More Men Infiltrating Professions Historically Dominated by Women" provides students with thought-provoking points to be considered in classroom discussions. Smith and Farris also indicate that a nontraditional occupation calls for consideration of some factors beyond those required by a traditional one—self confidence, for example, is a must. Class discussions could also center around questions that relate to both men and women in nontraditional careers:

1. How do you feel about yourself as a person? Will you be bothered by what friends and relatives say about your career choice?
2. How much do you like doing the type of work required in the nontraditional occupation?

3. What impact will a nontraditional job have on your social life and economic security?
4. What impact will a nontraditional occupation have on the length, location, and type of education and training you will have to obtain?
5. What realistic opportunities for employment, advancement, and personal growth are associated with the nontraditional career area?

The following questionnaires, checklists, and quiz are a starting point for the first part of this self-examination process. They can serve as a foundation to ensure that the teacher's influence over students' career choices is grounded in documented fact and in a strengthened awareness of sex equity issues. Following these exercises are specific suggestions for turning this awareness into positive action, both in the classroom and throughout the school.

The activities are organized as follows:

A. Awareness-Raising Activities

o Surveys to Examine Attitudes:

1. "Identifying and Alleviating Sexism in Education—An Introductory Assessment," reprinted from McCune, Shirley; Matthews, Martha; Boesdorfer, Kent; Kaser, Joyce; and Cusick, Judy: "Implementing Title IX: A Sample Workshop."

Open-ended questions to start individual teachers or a team of school personnel thinking about sex equity issues in education.

2. "Self-Administered Survey of Sex Stereotypes"
3. "Reducing Career Barriers Resulting from Sex-Role Stereotyping: A Self-intervention Manual for School Personnel."

Surveys 2 and 3 above are to be used individually to help identify and eliminate stereotyped attitudes. Non-threatening, low key, sometimes humorous. Can also be used in groups without insulting or demeaning group participants.

o Checklist to Evaluate Your School:

"Evaluating Your School." A tool for assessing some of the most common inequities in school systems, including discriminatory hiring and job classification policies and biased guidance and counseling practices.

o Checklists and Questionnaires to Assess Teaching Materials and Procedures:

1. Curriculum Checklist
2. Materials Questionnaire
3. Sex-Fair Teaching Behaviors Checklist
4. Classroom Checklist

To be used individually or in groups. Topics such as curriculum, textbook use and selection, bulletin board preparation, teaching styles, and classroom behaviors can be combined or adapted to suit a particular school or staff.

B. Passing Sex Equity Awareness on to Students:

Mechanisms to Turn Awareness into Action

o Quizzes, Articles, and Questionnaires to Stimulate Student Discussion:

1. Discussion Examples that Focus on Sex Equity and Work and Family Issues

To be used as discussion aids and mind-expanders. Students will find that their own notions about the real world may not quite reflect the way it is.

- a. "Self Awareness" Checklist
- b. "Changing Work Force and the Family" Quiz
- c. "Female/Male Participation in the Paid Work Force and in Vocational Education Programs: What are the Facts? (Answers provided.) A quiz to test your knowledge of the work world.
- d. Newspaper Article: "More Men Infiltrating Professions Historically Dominated By Women."

2. "Developing Students' Career Planning Skills."

A set of strategies and exercises to start students thinking about short-term and long-range career goals.

3. Other Ideas for Classroom and After School Activities

Specific classroom and extracurricular activities to encourage sex-fair teaching and equal promotion of math and science careers for men and women. To be used by teachers, counselors, department heads, and administrators to aid in breaking down stereotyped behavior in students' course and career selections.

A. Awareness-Raising Activities

IDENTIFYING and ALLEVIATING SEXISM in EDUCATION — AN INTRODUCTORY ASSESSMENT

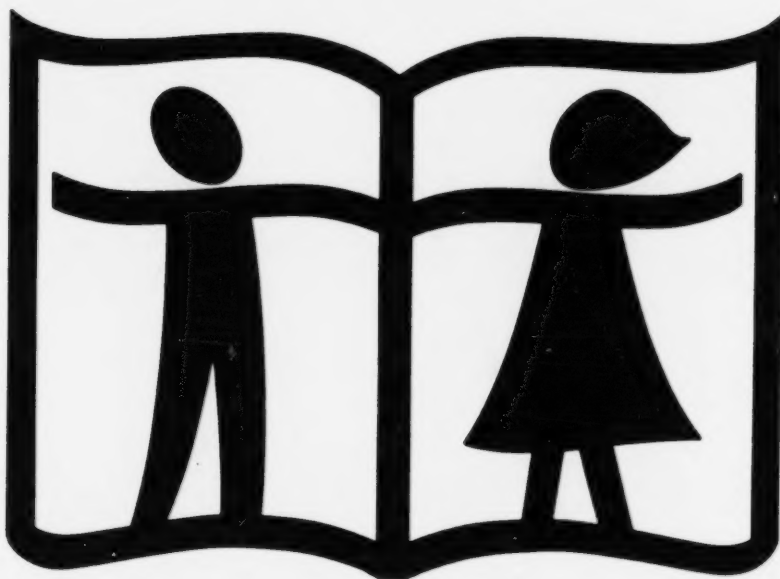
Think about the policies, practices, programs and the behavior of staff members in the education agency or institution in which you work.

1. List as many examples as you can identify of differential opportunity or treatment of female and male students and employees.
2. What efforts have been taken to eliminate sex differentiation in opportunity or treatment?
3. What, in your opinion, are the primary barriers to eliminating differential opportunities and treatment of female and male students? Of female and male employees?
4. What, in your opinion, are the support systems and resources for eliminating sexism in your school/institution?

Reprinted from: McCune, Shirley; Matthews, Martha; Boesdorfer, Kent; Kaser, Joyce; and Cusick, Judy. Implementing Title IX: A Sample Workshop.

Reprinted with Permission

Self-Administered Survey of Sex Stereotypes for Project **MASSIVE***



MACHINE - SCORABLE

Directions: This survey is designed to be used with the manual titled "Reducing Career Barriers Resulting From Sex Role Stereotyping." The scoring system is explained in that manual. For each item in the survey, MARK:

SA - if you **STRONGLY AGREE**
A - if you **AGREE**
N - if you are **NEUTRAL**
D - if you **DISAGREE**
SD - if you **STRONGLY DISAGREE**

*MASSIVE is an acronym for Modifying Attitudes of Sex
Stereotypes in Vocational Education.



Ohio Department of Education
Division of Guidance and Testing
65 South Front Street, Room 719
Columbus, Ohio 43215



Self-Administered Survey of Sex Stereotypes

	Mark ONE Response		Mark ONE Response
1. Outdoor jobs should be performed by men rather than women.	SA A N D SD	19. Women like to gossip more than men.	SA A N D SD
2. Men handle active jobs better than women.	SA A N D SD	20. Women cost their companies more than men because of a higher turnover and absenteeism rate.	SA A N D SD
3. Important decisions should be made by men rather than women.	SA A N D SD	21. Women are generally too dependent on others to handle top administrative jobs.	SA A N D SD
4. Women operate best behind the scenes.	SA A N D SD	22. Few architects are women because women typically do not have enough spatial ability.	SA A N D SD
5. Men, unlike women, generally act in an open, honest manner.	SA A N D SD	23. Men relate to others in a more direct way than women.	SA A N D SD
6. Women are better counselors than men because women show more empathy.	SA A N D SD	24. Men are naturally more insensitive to others.	SA A N D SD
7. Men make decisions based on sound logic more often than women.	SA A N D SD	25. Jobs such as loading or unloading trucks can be managed only by males.	SA A N D SD
8. Women generally perform better than men in cosmetology or dental hygiene because women have better finger dexterity.	SA A N D SD	26. If a male and female candidate have about the same qualifications for a high school principalship, the male should get the job.	SA A N D SD
9. Women as well as men should be prepared to support their families financially.	SA A N D SD	27. Men usually do not care when others are hurt.	SA A N D SD
10. Women care more about the feelings of others than men do.	SA A N D SD	28. Since they are less emotional than women, men are more objective.	SA A N D SD
11. All jobs should be open to both men and women.	SA A N D SD	29. Men should expect to bear the major responsibility for supporting a wife and family.	SA A N D SD
12. Men are smarter than women in science and math as proved by comparing test scores.	SA A N D SD	30. Men, more than women, evaluate all of the facts before making a decision.	SA A N D SD
13. Women in the work force prefer a subordinate role more so than men.	SA A N D SD	31. Standards for promotion and hiring should be the same for men and women.	SA A N D SD
14. Most married women who work do so to keep from being bored at home.	SA A N D SD	32. To work effectively women need more encouragement and approval than men.	SA A N D SD
15. Money spent educating a woman is as well spent as money spent educating a man.	SA A N D SD	33. Because men and women have basic psychological differences, they are suited to fill different roles.	SA A N D SD
16. Jobs requiring skills in caring for other people are performed best by women.	SA A N D SD	34. Men are better chemists or mathematicians than women.	SA A N D SD
17. Women are naturally better at interior decoration than men.	SA A N D SD	35. A wife's career is not as important to the family as her husband's.	SA A N D SD
18. Men have fewer original ideas than women.	SA A N D SD		

Mark ONE
ResponseMark ONE
Response

- | | | | |
|--|-------------------|---|-------------------|
| 36. Usually women work only for spending money, while men work to support their families. | SA (A) (N) (D) SO | 49. Men are harder to place as typists because they generally do not perform as well as women. | SA (A) (N) (D) SO |
| 37. Men and women should share equally the responsibility of rearing children. | SA (A) (N) (D) SO | 50. Men, more than women, are doers and providers. | SA (A) (N) (D) SO |
| 38. Jobs requiring skills in making high level administrative decisions are performed best by men. | SA (A) (N) (D) SO | 51. Stressful jobs should be filled by men rather than women. | SA (A) (N) (D) SO |
| 39. Men make better authority figures than women. | SA (A) (N) (D) SO | 52. Men and women should be paid the same for equivalent work. | SA (A) (N) (D) SO |
| 40. Men are more dependable than women. | SA (A) (N) (D) SO | 53. There are certain jobs and roles which only men should have and the same is true for women. | SA (A) (N) (D) SO |
| 41. Women who work generally prefer passive jobs. | SA (A) (N) (D) SO | 54. Women, more than men, prefer to take directions, not give them. | SA (A) (N) (D) SO |
| 42. Women prefer to rely upon others to make important decisions. | SA (A) (N) (D) SO | 55. After marriage, women should quit work to devote themselves to their husbands and families. | SA (A) (N) (D) SO |
| 43. Women are generally content to give in to males. | SA (A) (N) (D) SO | 56. Women expect to spend what men earn and to use what men build. | SA (A) (N) (D) SO |
| 44. Women usually cannot perform jobs requiring much mechanical aptitude. | SA (A) (N) (D) SO | 57. Women don't like to get dirty because they are more concerned with their appearance than men. | SA (A) (N) (D) SO |
| 45. Women are usually more underhanded than men. | SA (A) (N) (D) SO | 58. Women are typically more imaginative than men. | SA (A) (N) (D) SO |
| 46. People typically prefer to work for a male rather than for a female. | SA (A) (N) (D) SO | 59. Men rather than women should perform jobs likely to require courage. | SA (A) (N) (D) SO |
| 47. When under stress, women are naturally more emotional than men. | SA (A) (N) (D) SO | 60. The time and money spent on training women for high level jobs are largely wasted. | SA (A) (N) (D) SO |

Financed by funds provided under the Vocational Education Act of 1963, P.L. 88-210, as amended, and by the sponsoring state. The activity which included the development of these materials was funded in whole or in part by the U.S. Office of Education, Department of Health, Education and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

REDUCING CAREER BARRIERS RESULTING FROM SEX-ROLE STEREOTYPING: A SELF-INTERVENTION MANUAL FOR SCHOOL PERSONNEL

I hope that you have had the opportunity to respond to items included in a survey entitled "Self-Administered Survey of Sex Stereotypes." If you have the survey available and have not yet given your responses to it, please do so now. This section of the manual will help you summarize and examine your responses. If you do not have the survey available, you can still use this section by making a few changes in the procedures.

Before examining your answers to the Self-Administered Survey of Sex Stereotypes, please respond to the following statements using the same code that is in the survey.

Code: SA = Strongly Agree
A = Agree
N = Neutral
D = Disagree
SD = Strongly Disagree

Please circle your response.

SA	A	N	D	SD	A. An individual's level of employment and decision-making responsibilities in a career should be influenced by that person's sex.
SA	A	N	D	SD	B. An individual's sex should determine how important a career is to that individual's life.
SA	A	N	D	SD	C. An individual's sex should determine the type of career the person will have.
SA	A	N	D	SD	D. Expectations of how well an individual functions in a work setting should be influenced by that person's sex.
SA	A	N	D	SD	E. Expectations of what an individual's basic abilities are should be influenced by that person's sex.
SA	A	N	D	SD	F. An individual's career choices and opportunities should not be influenced by sex discrimination.

The preceding six items, lettered A-F, are general belief statements about sex role stereotyping. Each statement is a broad philosophical belief about what **should** or **should not** exist. Responses of Strongly Disagree (SD) for items A-E and a response of Strongly Agree (SA) for item F are considered toward the nonbiased direction. Your responses may help you identify your general beliefs in the six areas.

The separate survey that you took titled "Self-Administered Survey of Sex Stereotypes" includes more specific items that are grouped into the six topic areas covered by the statements above. The next sections of the manual will help you compare your responses to the survey items with each of your six belief statements.

Purpose: The purpose of examining your responses to the Self-Administered Survey of Sex Stereotypes is to help you to become more conscious of your views and expectations about male and female characteristics and functions related to careers. By being more conscious of your views and expectations, you can be aware of possible stereotyping behaviors that might result.

We will look at the survey results by organizing the items into six groups according to the content that is covered by the items. Keep your answers from the survey available so that you can record your results in this manual. If you have not taken the survey, please respond to the items reproduced in the manual. The directions to follow will be given step-by-step. Please proceed to the next page.

Group A: Expectations on Level of Employment and Decision-Making Responsibilities

Step 1—Identify your responses to the survey items 3, 7, 13, 21, 28, 30, 38, 39, 42, 46, 47, 48, 51 and 54. Each response receives a numerical score as shown below. Record the score for your response to each item on the line preceding the item.

Response	Score
Strongly Agree (SA)	= 5
Agree (A)	= 4
Neutral (N)	= 3
Disagree (D)	= 2
Strongly Disagree (SD)	= 1

Record item scores:

- _____ 3. Important decisions should be made by men rather than women.
- _____ 7. Men make decisions based on sound logic more often than women.
- _____ 13. Women in the work force prefer a subordinate role more so than men.
- _____ 21. Women are generally too dependent on others to handle top administrative jobs.
- _____ 28. Since they are less emotional than women, men are more objective.
- _____ 30. Men, more than women, evaluate all of the facts before making a decision.
- _____ 38. Jobs requiring skills in making high level administrative decisions are performed best by men.
- _____ 39. Men make better authority figures than women.
- _____ 42. Women prefer to rely upon others to make important decisions.
- _____ 46. People typically prefer to work for a male rather than for a female.
- _____ 47. When under stress, women are naturally more emotional than men.
- _____ 48. Jobs requiring logical thinking should be filled by men rather than women.
- _____ 51. Stressful jobs should be filled by men rather than women.
- _____ 54. Women, more than men, prefer to take directions, not give them.
- _____ Total Score (add all scores)

Step 2—Compute your average score: Total score _____ + 14 = _____ (round to the nearest tenth)

Step 3—Using the same scoring system, record the numerical score for your response to item A on page 7. _____

Step 4—Analyze the results.

- a. Is your average score, computed in step 2, higher than 2.0? If yes, this could be a clue that you might have some sex role stereotyping expectations concerning people's levels of employment and decision-making responsibilities.
- b. Review the items for which you scored 3 or higher.
- c. Compare your average score with your score on item A recorded in step 3. Are the two scores different by more than 1 point? If yes, this may mean that a contradiction exists between your general belief stated in item A and your specific views stated in the 14 items.

Interpretation:

Group A includes items on sex role stereotyping expectations on level of employment and decision-making responsibilities of males and females. A score toward the Strongly Agree direction would tend to indicate that you believe employment in high level positions is more appropriate for men than women.

Comments:**Group B: Expectations on the Importance or Purpose of Employment**

Step 1 — Identify your responses from the survey to items 14, 29, 35, 36, 50, 55, 56, and 60. Record your numerical scores in front of each item below. Use the following scoring system:

Response	Score
Strongly Agree (SA)	= 5
Agree (A)	= 4
Neutral (N)	= 3
Disagree (D)	= 2
Strongly Disagree (SD)	= 1

- _____ 14. Most married women who work do so to keep from being bored at home.
- _____ 29. Men should expect to bear the major responsibility for supporting a wife and family.
- _____ 35. A wife's career is not as important to the family as her husband's.
- _____ 36. Usually women work only for spending money, while men work to support families.
- _____ 50. Men, more than women, are doers and providers.
- _____ 55. After marriage, women should quit work to devote themselves to their husbands and families.
- _____ 56. Women expect to spend what men earn and to use what men build.
- _____ 60. The time and money spent on training women for high level jobs are largely wasted.
- _____ Total Score (add all scores)

Step 2 — Compute your average score: Total score _____ ÷ 8 _____ (round to the nearest tenth)

Step 3 — Using the same scoring system, record the numerical score for your response to item B on page 7. _____

Step 4—Analyze the results.

- a. Is your average score, computed in step 2, higher than 2.0? If yes, this could be a clue that you might have some sex role stereotyping expectations concerning the importance or purpose of employment for males and females.
- b. Review the items for which you scored 3 or higher.
- c. Compare your average score with your score on item B recorded in step 3. Are the two scores different by more than 1 point? If yes, this may mean that a contradiction exists between your general belief stated in item B and your specific views stated in the 8 items.

Interpretation:

Group B includes items on sex role stereotyping of the importance or purpose of employment for males and females. A score toward the Strongly Agree direction would tend to indicate that you believe employment for women is less important than employment for men.

Comments:

Group C: Expectations on Type of Employment

Step 1—Identify your responses from the survey to items 1, 2, 6, 10, 16, 17, 18, 24, 26, 27, 41, 43, 53, and 58. Record your numerical scores in front of each item below. Use the following scoring system:

Response	Score
Strongly Agree (SA)	= 5
Agree (A)	= 4
Neutral (N)	= 3
Disagree (D)	= 2
Strongly Disagree (SD)	= 1

- _____ 1. Outdoor jobs should be performed by men rather than women.
- _____ 2. Men handle active jobs better than women.
- _____ 6. Women are better counselors than men because women show more empathy.
- _____ 10. Women care more about the feelings of others than men do.
- _____ 16. Jobs requiring skills in caring for other people are performed best by women.
- _____ 17. Women are naturally better at interior decoration than men.
- _____ 18. Men have fewer original ideas than women.

- _____ 24. Men are naturally more insensitive to others.
- _____ 26. If a male and female candidate have about the same qualifications for a high school principalship, the male should get the job.
- _____ 27. Men usually do not care when others are hurt.
- _____ 41. Women who work generally prefer passive jobs.
- _____ 43. Women are generally content to give in to males.
- _____ 53. There are certain jobs and roles which only men should have and the same is true for women.
- _____ 58. Women are typically more imaginative than men.
- _____ Total Score (add all scores)

Step 2—Compute your average score: Total score _____ $\div$ 14 = _____ (round to the nearest tenth)

Step 3—Using the same scoring system, record the numerical score for your response to item C on page 7. _____

Step 4—Analyze the results.

- a. Is your average score, computed in step 2, higher than 2.0? If yes, this could be a clue that you might have some sex role stereotyping expectations on types of employment for males and females.
- b. Review the items for which you scored 3 or higher.
- c. Compare your average score with your score on item C recorded in step 3. Are the two scores different by more than 1 point? If yes, this may mean that a contradiction exists between your general belief stated in item C and your specific views stated in the 14 items.

Interpretation:

Group C includes items on sex role stereotyping on types of employment for females and males. A score toward the Strongly Agree direction would tend to indicate that you believe some types of jobs are for females and other types of jobs are for males.

Comments:

Group D: Expectations of How Well Individuals Will Function in a Work Setting

Step 1—Identify your responses from the survey to items 4, 5, 19, 20, 23, 32, 33, 40, 45, 57 and 59. Record your numerical scores in front of each item below. Use the following scoring system:

Response	Score
Strongly Agree (SA)	= 5
Agree (A)	= 4
Neutral (N)	= 3
Disagree (D)	= 2
Strongly Disagree (SD)	= 1

- _____ 4. Women operate best behind the scenes.
- _____ 5. Men, unlike women, generally act in an open, honest manner.
- _____ 19. Women like to gossip more than men.
- _____ 20. Women cost their companies more than men because of a higher turnover and absenteeism rate.
- _____ 23. Men relate to others in a more direct way than women.
- _____ 32. To work effectively women need more encouragement and approval than men.
- _____ 33. Because men and women have basic psychological differences, they are suited to fill different roles.
- _____ 40. Men are more dependable than women.
- _____ 45. Women are usually more underhanded than men.
- _____ 57. Women don't like to get dirty because they are more concerned with their appearance than men.
- _____ 59. Men rather than women should perform jobs likely to require courage.
- _____ Total Score (add all scores)

Step 2—Compute your average score: Total score _____ $\div$ 11 = _____ (round to the nearest tenth)

Step 3—Using the same scoring system, record the numerical score for your response to item D on page 7. _____

Step 4—Analyze the results.

- Is your average score, computed in step 2, higher than 2.0? If yes, this could be a clue that you might have some sex role stereotyping expectations on how well males and females will function in a work setting.
- Review the items for which you scored 3 or higher.
- Compare your average score with your score on item D recorded in step 3. Are the two scores different by more than 1 point? If yes, this may mean that a contradiction exists between your general belief stated in item D and your specific views stated in the 11 items.

Interpretation:

Group D includes items on sex role stereotyping of how well females and males function in a

work setting. A score toward the Strongly Agree direction would tend to indicate that you believe men function better as workers than women.

Comments:

Group E: Expectations of an Individual's Basic Abilities

Step 1 — Identify your responses from the survey to items 8, 12, 22, 25, 34, 44, and 49. Record your numerical scores in front of each item below. Use the following scoring system:

Response	Score
Strongly Agree (SA)	= 5
Agree (A)	= 4
Neutral (N)	= 3
Disagree (D)	= 2
Strongly Disagree (SD)	= 1

- _____ 8. Women generally perform better than men in cosmetology or dental hygiene because women have better finger dexterity.
- _____ 12. Men are smarter than women in science and math as proved by comparing test scores.
- _____ 22. Few architects are women because women typically do not have enough spatial ability.
- _____ 25. Jobs such as loading or unloading trucks can be managed only by males.
- _____ 34. Men are better chemists or mathematicians than women.
- _____ 44. Women usually cannot perform jobs requiring much mechanical aptitude.
- _____ 49. Men are harder to place as typists because they generally do not perform as well as women.
- _____ Total Score (add all scores)

Step 2 — Compute your average score: Total score _____ $\div 7 =$ _____ (round to the nearest tenth)

Step 3 — Using the same scoring system, record the numerical score for your response to item E on page 7. _____

Step 4 — Analyze the results.

- a. Is your average score, computed in step 2, higher than 2.0? If yes, this could be a clue that you might have some stereotyped expectations about the differences in basic abilities of males and females.

- b. Review the items for which you scored 3 or higher.
- c. Compare your average score with your score on item E recorded in step 3. Are the two scores different by more than 1 point? If yes, this may mean that a contradiction exists between your general belief stated in item E and your specific views stated in the 7 items.

Interpretation:

Group E includes items on sex role stereotyping of the basic abilities of females and males. A score toward the Strongly Agree direction would tend to reflect the belief that women and men have different basic abilities that affect employment competencies.

Comments:

Group F: General Beliefs About What Should Exist

Step 1 — Identify your responses from the survey to items 9, 11, 15, 31, 37 and 52. Record your numerical scores in front of each item below. Use the following scoring system:

Response	Score	
Strongly Agree (SA)	= 1	
Agree (A)	= 2	(Please note that the scoring of this group is the reverse of the other groups.)
Neutral (N)	= 3	
Disagree (D)	= 4	
Strongly Disagree (SD)	= 5	

- _____ 9. Women as well as men should be prepared to support their families financially.
- _____ 11. All jobs should be open to both men and women.
- _____ 15. Money spent educating a woman is as well spent as money spent educating a man.
- _____ 31. Standards for promotion and hiring should be the same for men and women.
- _____ 37. Men and women should share equally the responsibility of rearing children.
- _____ 52. Men and women should be paid the same for equivalent work.
- _____ Total Score (add all scores)

Step 2 — Compute your average score: Total score _____ $\div$ 6 = _____ (round to the nearest tenth)

Step 3 — Using the same scoring system, record the numerical score for your response to item F on page 7. _____

Step 4—Analyze the results.

- a. Is your average score, computed in step 2, higher than 2.0? If yes, this could be a clue that you might have some general sex role stereotyping beliefs about the careers and job opportunities of males and females.
- b. Review the items for which you scored 3 or higher.
- c. Compare your average score with your score on item F recorded in step 3. Are the two scores different by more than 1 point? If yes, this may mean that a contradiction exists between your general belief stated in item F and your views stated in the 6 items.

Interpretation:

Group F includes items on general beliefs about what should exist in attitudes toward the work of women and men. A score toward the Strongly Disagree direction would indicate a general sex role bias. Remember that the scoring system for this section is the reverse of that for other sections.

Comments:

Adapted from: "Reducing Career Barriers Resulting from Sex Role Stereotyping," Project Massive, Ohio Department of Education, Columbus, Ohio.

Reprinted with Permission

A. Awareness-Raising Activities

EVALUATING YOUR SCHOOL

A professed goal of our democratic society is the provision of equal opportunity. Education is one of the ways in which we can implement this goal. The following instrument is a tool for assessing some of the most common manifestations of inequality in schools.

I. SCHOOL LEADERSHIP AND PERSONNEL

A. Listed below are the categories of school system personnel. Indicate the number of persons in each category in your school system. Then compare the totals (e.g., all females, all males, all racial and cultural minority groups, all minority group women, etc.).

Category	Total		MINORITY GROUPS ¹					
	F	M	(group)		(group)		(group)	
			F	M	F	M	F	M
Board of Education								
Officers								
Members								
Superintendent's Office								
Superintendent								
Administrative Staff								
Professional Staff								
Clerical Staff								
Total Staff								
School Personnel								
Elementary School Teachers								
Secondary School Teachers								
Elementary Administrators								
Secondary Administrators								
Supervisory Personnel								
Nonteaching Staff ²								

Students

- Fill in the racial and cultural minority groups most populous in your community, e.g., Black, Spanish-speaking, Indian, Asian, etc.
- Nonteaching staff would include secretaries, teacher aides, maintenance staff, nurses, librarians, counselors, and social workers.

	Yes	No
B. Are these statistics satisfactory to you?	_____	_____
C. Has an affirmative action plan been developed for your school?	_____	_____
D. What actions, if any, are being taken to develop more representative leadership and personnel?	_____	_____
E. What are the average salaries of:		
Male administrators?	_____	_____
Female administrators?	_____	_____
White administrators?	_____	_____
Black/Minority administrators?	_____	_____
Male teachers?	_____	_____
Female teachers?	_____	_____
White teachers?	_____	_____
Black/Minority teachers?	_____	_____
F. Are there differences among females, males, and minority group staff with respect to such fringe benefits as:	Yes	No
Retirement plans?	_____	_____
Maternity and/or family leave?	_____	_____
Insurance benefits?	_____	_____
Sabbatical and training opportunities?	_____	_____

- G. Analyze career promotion practices and opportunities for males, females, and minority groups, including:
- Number of years' service before promotion
 - Positions occupied before promotion
 - Qualifications of previous occupants of positions

	Yes	No
Other? _____		
Are students encouraged to exercise their personal choice?	_____	_____
H. Are all students encouraged to participate in:		
Arts and crafts activities?	_____	_____
Drama activities?	_____	_____
Musical groups?	_____	_____
Dance groups?	_____	_____
Athletics?	_____	_____
Student government?	_____	_____
I. Do school groups include activities representing a variety of cultural contributions, to provide positive experiences for all students (e.g., Latin American music, African art, Asian music, American Indian dance forms)?	_____	_____
J. Are teachers and other personnel assigned to schools or classes on the basis of race or sex?	_____	_____
Are there minority group teachers in schools with minority group populations?	_____	_____
Are there male teachers in the elementary schools?	_____	_____

II. CURRICULUM DEVELOPMENT AND MATERIALS

- A. To what degree do instructional materials perpetuate racial or sex-role stereotypes?

	Yes	No
Are teachers provided the information they need to analyze instructional materials for sexist and racist content?	_____	_____
Are students encouraged to make critical analysis of instructional materials?	_____	_____
Are students and teachers encouraged to bring in materials that portray both men and women in positive and unstereotyped ways? Materials that portray a variety of cultural groups in positive and unstereotyped ways?	_____	_____
Have members of the curriculum development staff developed supplementary materials that avoid racial and sex-role stereotypes?	_____	_____

	Yes	No			
B. Do social science and history courses include the contributions and roles of all the cultural and racial groups in our society? Those of women?	_____	_____	I. Are courses in women's studies included in the elementary curriculum?	_____	_____
C. Do social science and history courses include the study of other societies in which the sexes and various racial groups have different roles than in the United States?	_____	_____	The middle school curriculum?	_____	_____
D. Do literature courses include authors with a variety of racial-cultural perspectives?	_____	_____	The senior high school curriculum?	_____	_____
Female authors?	_____	_____			
E. Are health and sex education included in the curriculum?	_____	_____	III. COUNSELING AND GUIDANCE PROGRAMS		
Are topics such as birth control, venereal disease, and abortion covered?	_____	_____		Yes	No
Is the human reproductive system included in science courses?	_____	_____	A. Are counselors available to all students upon request?	_____	_____
If so, at what level?	_____	_____	B. Are boys, girls, or minority group children referred to the counselors more frequently?	_____	_____
F. Do graphics, pictures, and audio-visuals used in the curriculum include a variety of cultural groups in nonstereotyped roles?	_____	_____	C. Do counselors recommend courses on the basis of a student's race or sex?	_____	_____
G. Do graphics, pictures, and audio-visuals present men at home caring for children?	_____	_____	D. Are all students encouraged to explore the advantages and disadvantages of their course preferences, analyzing factors other than traditional role expectations based on sex or race?	_____	_____
Cleaning?	_____	_____	E. Is the school using career materials which track boys, girls, or minority group children into specified directions?	_____	_____
Cooking?	_____	_____	F. Are vocational and career counseling and programs operating which provide role models of men, women, and minority group members?	_____	_____
Women doing anything besides caring for children?	_____	_____			
H. Are courses in ethnic studies included in the elementary curriculum?	_____	_____			
The middle school curriculum?	_____	_____			
The senior high school curriculum?	_____	_____			

(This material has been developed and disseminated through a Sex Equity grant of the Ohio Department of Education, Division of Vocational Education, November 1978, in accordance with the sex equity mandates of P.O. 94-482, Title IX, HEW Form 441, and HEW Form 641. Points of view do not necessarily represent official USOE or Ohio Department of Education position or policy.)

Reprinted with Permission

A. Awareness-Raising Activities

CURRICULUM CHECKLIST

	Yes	No
Have I encouraged the development of nonsexist curricula by:		
1. Including content by and about culturally and ethnically diverse women in my classes? (Use materials checklist as an additional guide. Also examine course syllabi and list of guest speakers.)	_____	_____
2. Discussing problems associated with sex roles and sex stereotyping in a variety of courses (psychology, sociology, economics, political science, law, literature, biology, home economics, family living, etc.)?	_____	_____
3. Recognizing that women's studies courses constitute a rich, legitimate, and long-neglected academic discipline in and of itself?	_____	_____
4. Asking students for feedback on any stereotyping (sex, race, age, class) they might encounter in the curriculum?	_____	_____
5. Selecting graphics, pictures, and other audio-visual materials which present culturally and ethnically diverse women in roles which go beyond child care, cooking, cleaning, clerking, nursing, and teaching?	_____	_____
6. Selecting graphics, pictures, and other audio-visual materials which present culturally and ethnically diverse men in a variety of roles, including child care, cooking, and house cleaning?	_____	_____
7. Changing course titles which use the generic <u>man</u> or male pronouns (e.g., <u>Man: A Course of Study</u>)?	_____	_____
8. Ensuring that students are not excluded from courses or programs because of sex?	_____	_____
9. Encouraging boys to enroll in home economics and secretarial courses and girls to enroll in industrial arts courses?	_____	_____
10. Analyzing business education courses for sex stereotyping in content and practices?	_____	_____
11. Encouraging girls and boys to choose from all the musical instruments for orchestra and band (e.g., boys can play the flute; girls, the drums)?	_____	_____

	<u>Yes</u>	<u>No</u>
12. Encouraging boys and girls to consider all kinds of occupations, lead discussions equally, etc.?	_____	_____
13. Developing nonsexist, nonracist guidelines for all personnel to follow in purchasing and using textbooks and other instructional materials?	_____	_____
14. Encouraging members of the curriculum development staff to prepare curriculum which avoids sex and race stereotyping?	_____	_____
15. Encouraging curriculum development staff and teachers to identify resources to assist in preparing such curriculum?	_____	_____
16. Requesting and using funds available for instructional materials to build supplementary resource materials collections for the classroom/school/district?	_____	_____

Adapted by: Violet Strahler, Ph.D., from Project Awareness, published by the Superintendent of Public Instruction and Feminist Northwest, Olympia, Washington, 1981.

Reprinted with Permission

MATERIALS QUESTIONNAIRE

	Yes	No
1. Are women and men from diverse cultural and ethnic backgrounds portrayed in a wide range of roles, including nontraditional ones? (Are women present as authors in literature anthologies; as scientists in science books; as leaders, reformers, pioneers, etc., in history books; as managers in business education books; and as machinists, farmers, heroes, and mayors? Are men present as homemakers, secretaries, elementary school teachers, telephone operators, clerks, and fathers?)	_____	_____
2. How well integrated into texts are the comments on women? Are the comments bunched into a separate "women's page," chapter, or paragraph? Are women of different racial, religious, and ethnic groups included?	_____	_____
3. Does the author make generalizations about "man"? Does "man" mean "human" or "male"? If it means "human," are the activities, characteristics, etc., described or pictured common to both sexes? If it means "males," is equal coverage given to "women"? (The "generic" usage of "man" and "mankind" should be replaced by "human," "humankind," and "people" since "man" and "mankind" are ambiguous, and worse, make many girls and women feel excluded and dehumanized.)	_____	_____
4. Count the pictures of people in curriculum materials. Are females half of the total? Do women, men, girls, and boys represent diverse racial, religious, ethnic, and class backgrounds? In pictures which illustrate both females and males, are females independently significant, or are they appendages to male characters?	_____	_____
5. Does content focus as often on females as on males? Does the material portray females and males of diverse racial, religious, and ethnic groups, with their similarities and differences described in such a way as to build positive images?	_____	_____
6. How much emphasis is given to traditional "female" values, such as compassion, consideration, and tenderness, as opposed to traditional "male" values such as assertiveness, risk taking, and strength? Are all these values offered as ideals for both sexes?	_____	_____
7. Are males shown reading, being admired for their school achievement? Or do the pictures or story suggest that boys are too active and mischievous to be successful in school?	_____	_____

	<u>Yes</u>	<u>No</u>
8. Does the story line show subtle bias? For example, do males (especially white males) have the power and make decisions? Do females or minority groups function in subservient positions?	_____	_____
9. Are the achievements of girls and women based on their own initiative and intelligence, or is their success due to their good looks or to their relationships with males? Would the story be essentially the same if the gender, or ethnic group, of the characters were reversed? If not, is there stereotyping that suggests a negative image of females? Males? People of particular ethnic groups?	_____	_____
10. When boys and girls have different viewpoints, are the girls' behaviors looked upon as "problems" to be "solved"? Are girls expected to "act like boys" in order to be accepted as their comrades or as equals? Are sensitive boys labeled "sissies"?	_____	_____
11. Does the material assist students to clearly recognize and to accept basic similarities among all members of the human race, and the uniqueness and worth of every individual, regardless of sex, race, religion, age, or class background?	_____	_____
12. Does the material present a significant number of instances of fully integrated human groupings (sex, age, race, class) and settings to indicate equal status and non-segregated social relationships?	_____	_____
13. Are quotations, references, and extra reading recommendations authored by women as well as by men? How many of the authors are ethnic minorities?	_____	_____
14. Are examples of women and men used equally to illustrate theories and ideas? In examples or illustrations are females shown in passive behavior and males in more active situations as heroes, authors, researchers, doers, and accomplisners? Do women have names, or are they known as "Mother," or as "_____'s wife?"	_____	_____
15. Does the material show <u>awareness</u> of a variety of people? Is more than one minority group shown? Are women of several physical types portrayed? Or are the women all young, pretty, slim?	_____	_____

16. Does the material acknowledge the validity of a variety of lifestyles? Are adults who have chosen not to marry or have children portrayed favorably? When families are portrayed, do family relationships show individuals subordinated to one another because of sex? Are first born-children girls as often as boys? Are children and adults portrayed in single-parent families and in extended families (grandparents and other relatives, divorced and remarried parents, more than one family living together)? Does the portrayal emphasize the positive aspects of such family arrangements rather than suggesting that such arrangements are necessarily damaging to children?

17. Do sex education and family living materials limit their discussion to heterosexual, married relationships?

18. Are terms such as "the weaker sex" and "the little woman," etc., used? Are women referred to as "wives" as often as men are referred to as "husbands"?

19. Does personification of inanimate objects and animals involve the female with sex stereotypes?

20. Are there stories, reading selections, activities, and study units which discuss and criticize sex and race stereotyping?

Reprinted from: Project Awareness, Superintendent of Public Instruction and Feminist Northwest, Olympia, Washington, 1981.

Reprinted with Permission

CHECKLIST OF SEX FAIR TEACHING BEHAVIORS

In my teaching, I	Always	Usually	Never
1....provide the same course content for students of both sexes.	_____	_____	_____
2....provide the same learning activities and projects for students (rather than different ones such as more labs for boys, more seat work for girls).	_____	_____	_____
3....set the same standards of behavior for all students in my classroom (i.e., attention, quiet, visiting, etc.)	_____	_____	_____
4....allow all students equal access to tools and equipment. (Same standards for use apply to students of both sexes.)	_____	_____	_____
5....encourage all students to be equally considerate and courteous of others (instead of boys being chivalrous and girls ladylike).	_____	_____	_____
6....administer the same reprimands or disciplinary actions to students for misbehavior (rather than "John, go see the principal" and "Jean, see me after class").	_____	_____	_____
7....avoid comparing boys to girls or girls to boys in respect to classroom behaviors, attitudes and accomplishments (e.g., "The girls in this class are setting an excellent example").	_____	_____	_____
8....refer to students' friends as "friends" rather than caustically or automatically referring to all friends of the opposite sex as "boyfriends" or "girlfriends."	_____	_____	_____

	Always	Usually	Never
9....use gender-free terms and occupational titles rather than sex-specific ones (i.e., "human" and "person" instead of "mankind," "man," "policeman," "saleslady").	_____	_____	_____
10....avoid stereotypic phrases as "boys will be boys" and "girls should act ladylike."	_____	_____	_____
11....give equivalent attention to students of both sexes (rather than more criticism for boys, support for girls, or vice versa).	_____	_____	_____
12....establish the same safety and/or sanitation and dress requirements for all students (i.e., all students with hair a certain length wear hairnets, all students wear coveralls, etc.).	_____	_____	_____
13....establish and apply the same grading system to students of both sexes (not "allowing" for one sex to be less capable).	_____	_____	_____
14....incorporate the topic of sex discrimination, stereotyping and bias into regular course content and discussions whenever appropriate.	_____	_____	_____
15....provide information to students about expanding occupational and/or family activities for both sexes in areas that have traditionally been considered appropriate for only one sex.	_____	_____	_____
16....assist both boys and girls in recognizing that their adult roles will probably include work, parenting, and homemaking.	_____	_____	_____
17....involve students in identifying examples of sex discrimination, stereotyping and bias in textbooks, curriculum materials, media, and other course-related materials as trade journals, job descriptions and application forms.	_____	_____	_____
18....help students identify sex discrimination and stereotyping in their education and in their personal lives.	_____	_____	_____

	Always	Usually	Never
19....request anonymous student evaluations concerning any sex discrimination, stereotyping and bias in textbooks, curriculum materials, media and other course-related materials as trade journals, job descriptions and application forms.	_____	_____	_____
20....encourage students to correct me if I "slip" and use sex specific terms or sexist generalizations (i.e., telling a girl she did a man-sized job).	_____	_____	_____

Reprinted from: Expanding Adolescent Role Expectations: Information, Activities Resources for Vocational Educators, Cornell University, Ithaca, New York, 1978.

Reprinted with Permission

CLASSROOM CHECKLIST

Check the climate and procedures of your classroom for Sex Equity.

<u>ITEM</u>	<u>Yes</u>	<u>No</u>	<u>Not Sure</u>
1. Are bulletin board topics appropriate for students of both sexes?	_____	_____	_____
2. Is mandatory apparel (lab coats, hard hats, etc.) suitable for both sexes?	_____	_____	_____
3. Are units of instruction flexible for both sexes?	_____	_____	_____
4. Are role models available for both sexes?	_____	_____	_____
5. Are printed materials free of sex bias?	_____	_____	_____
6. Are teaching materials free of sex bias?	_____	_____	_____
7. Are students of both sexes encouraged to enroll in your classes?	_____	_____	_____
8. Are teaching methods free of sex bias?	_____	_____	_____
9. Do teaching examples relate to both sexes?	_____	_____	_____
10. Does instruction allow for differences in entry level skills?	_____	_____	_____
11. Is the physical environment interesting to both sexes?	_____	_____	_____
12. Is non-verbal behavior free of sex bias?	_____	_____	_____
13. Are handouts free of bias?	_____	_____	_____
14. Is the classroom climate free of sex bias?	_____	_____	_____
15. Are attempts made to eliminate sex bias in job placement situations?	_____	_____	_____

	<u>Yes</u>	<u>No</u>	<u>Not Sure</u>
16. Are attempts made to educate advisory committee members and others in the community about sex fairness?	_____	_____	_____
17. Do students have equal opportunities to do tasks?	_____	_____	_____
18. Are students of both sexes encouraged to belong to school organizations?	_____	_____	_____
19. Do other teachers view your program as suitable for both males and females?	_____	_____	_____
20. Do others view you as providing equal opportunities for both males and females?	_____	_____	_____

Developed by Shirley Slater, June Varner, and Carolyn Quattrocki, 1978.

Reprinted with Permission

B. Passing Sex Equity Awareness on to Students: Mechanisms to Turn Awareness into Action

1. Discussion Examples That Focus on Sex Equity

The following handouts may help to stimulate further discussions that relate to the opportunities for young men and women to enter nontraditional careers. These questionnaires shift from those designed to raise the consciousness of faculty, colleagues, and students to questions that will help students clarify their perceptions of the world of work and focus on sex equity issues related to work and family roles. As you administer these questionnaires, ask students if they are making career choices based on what they want or what other people expect of them. Ask them to think about the effects of sex role stereotyping on their lives, especially as it relates to the kinds of work they would like to do. Have them answer the questions in the following Self Awareness Checklist to discern their own values about sex roles.

SELF AWARENESS CHECKLIST

Sex Role Stereotyping

The following questions may help clarify values with respect to sex roles. There are no right or wrong answers. Indicate whether or not you agree with each statement. If you are part of a group of students, compare your answers within the group and discuss the reasons why you agree or disagree. Do men and women respond differently?

	Agree	Disagree	Opinion
1. A career is necessary for a woman to be truly satisfied.	_____	_____	_____
2. A career is necessary for a man to be truly satisfied.	_____	_____	_____
3. Being a wife and mother is necessary for a woman to be truly satisfied.	_____	_____	_____
4. Being a husband and father is necessary for a man to be truly satisfied.	_____	_____	_____
5. Men and women should share equal responsibility for housekeeping chores.	_____	_____	_____
6. Parents should share equally in caring for their children.	_____	_____	_____
7. Men and women should share responsibility for contributing to family income.	_____	_____	_____
8. A working wife should earn less than her husband.	_____	_____	_____
9. Women should not hold jobs in which they get dirty.	_____	_____	_____
10. Men should not be expected to do things around the house that would embarrass them in front of their friends.	_____	_____	_____

Source Unknown

THE CHANGING WORK FORCE AND THE FAMILY: A QUIZ

This quiz can be used as a way to arouse interest and motivate students. It may serve as a transition from introductory sessions on sex equity into the more substantive sessions or as a pre-test or post-test for a sex equity unit. The quiz works because it's fast and factual, a hook for deeper discussion. It will expand student views of their potential family roles.

Some teacher-tested strategies for using the quiz include:

- o Ask students to use the quiz to survey other students, teachers, and parents. Survey results can be presented as reports or articles in the school paper.
- o Ask students to research for the answers and then discuss the correct responses using the answer sheet.
- o Have small groups of students decide what they think the right answers are for four, five or even all of the questions. This group approach can lead to informative discussions, debates, and comparisons of viewpoints.
- o Run a contest between groups to see who can find the most answers.
- o Write one question on the blackboard each day if time is limited. Or give students a day to think a question through, then discuss it in class.

CHANGING WORK FORCE AND FAMILY QUIZ

Instructions: The following are either true or false statements about work, families and sex stereotyping. Circle the T for each one you believe is true and F if you believe the statement is false.

- | | | |
|---|---|--|
| T | F | 1. A majority of women work because of economic need. |
| T | F | 2. Women have a much higher absentee rate from their jobs than men. |
| T | F | 3. Males tend to have more difficulty than females in expanding their roles beyond traditional expectations. |
| T | F | 4. The majority of families are supported solely by the father's income. |
| T | F | 5. The average female worker is slightly less educated than the average male worker. |
| T | F | 6. More young men than young women believe a woman's place is in the home. |
| T | F | 7. Today more than half of all women between 18 and 64 years of age are in the labor force. |
| T | F | 8. The single woman usually is employed for 40 or fewer years. |
| T | F | 9. The average age at which young people marry today has not changed considerably in the past 15 years. |
| T | F | 10. A majority of women who leave work to have children return to work. |
| T | F | 11. Women change jobs more often than men. |
| T | F | 12. From 1970 to 1976, there was a 33 percent increase in households maintained by women only. |
| T | F | 13. Most unemployed men do not have the education or the skills to qualify for many of the jobs held by women. |
| T | F | 14. The average number of people per household today is four. |
| T | F | 15. Employed women are offered fewer positions of responsibility than employed men. |
| T | F | 16. When wives work outside the home, their husbands spend significantly more time on household chores. |
| T | F | 17. The employment of mothers leads to juvenile delinquency among their young children. |
| T | F | 18. In 1976, one out of every five children under 18 years of age lived in one-parent families. |
| T | F | 19. Most men who have worked for women supervisors do not complain about working for a woman. |
| T | F | 20. The average female worker earns less than three-fifths of what the average male worker does, even when each works full time. |

(Answers on page 54)

ANSWERS TO CHANGING WORK FORCE AND FAMILY QUIZ

1. T Of the nearly 34 million women in the labor force in March 1973, nearly half were working because of pressing economic need. They were either single, widowed, divorced or separated or had husbands whose incomes were less than \$3,000 a year. Another 4.7 million had husbands with incomes between \$3,000 and \$7,000. The Bureau of Labor Statistics estimate of the income necessary to maintain a low standard of living for an urban family of four in 1972 was \$7,386.
2. F A Public Health Service study of work time lost by persons 17 years of age and over because of illness or injury shows an average of 5.6 days lost by women and 5.3 days lost by men during the 1967 calendar year. Significant differences were noted between men and women in the amount of time lost because of acute or chronic illness. Women lost an average of 3.7 workdays because of acute illness; men averaged just 3.3 days away from work for this reason. On the other hand, men were more likely than women to be absent because of chronic conditions such as heart trouble, arthritis, rheumatism and orthopedic impairment.
3. T Research indicates that the social-emotional development of both sexes is hindered by sex-role stereotyping. Though some believe that females are more apt to be limited by stereotyping, it would appear that males are more adversely affected in many ways. There is evidence of more pressure among males to conform to the masculine stereotype earlier in life than for females to conform to the feminine stereotype. It appears to be more difficult for males than females to unlearn stereotyped behaviors.
4. F A survey conducted in 1972 determined that the husband was the only wage earner in fewer than three of eight husband-wife families. In 49 percent of husband-wife families, both husband and wife were wage earners. Only 36 percent were supported solely by the husband's income.
5. F Between men and women workers, the gap in average (mean) years of schooling completed has been narrowing and has almost disappeared. By 1973 the corresponding means were 12.1 among women workers and 12.0 among men workers. A smaller proportion of women workers were in the lowest educational groups.
6. T Survey research indicates that more adolescent males than adolescent females believe homemaking and child rearing are the responsibilities of women and that "a woman's place is in the home."
7. T Fifty-four percent of all women 18 to 64 years of age are in the labor force. Statistics also indicate that more than 60 percent of all women between the ages of 20 and 24 are participating in the labor force. Up to the age of 55, at least 50 percent of all women are participating in the work force. The trend is for younger women to join the labor force at an earlier age.
8. F The expected work life of a woman is closely related to her marital status and the number of children she has. In the large group of women who enter the labor force by age 20, the relatively small number who don't marry have a work life expectancy of 45 years. This is about 10 years longer than for those women in the group who marry but have no children and about two to three years longer than for those who become widowed or divorced.
9. F The median age at which young people marry is changing, particularly among young women. By 1976, 72 percent of the 19-year-old women were single, compared to 60 percent in 1960. Among 20- to 24-year olds of both sexes, more than 62 percent of the males and 42 percent of the females were single in 1976, compared to 53 percent of the males and 28 percent of the females in 1960.
10. T In 1974, 54 percent of the 15.8 million mothers of children between the ages of 6 and 17 were in the work force. (This figure would have been higher if it included mothers who returned to the labor force after their children had grown up or passed the age of 18.)
11. F The work life pattern of women shows that many work for a few years after school, leave the labor force for marriage and, particularly, childbearing, and return to the labor force after their children are grown or reach school age. This would tend to increase their labor force turnover. Some studies have indicated that turnover rates for women are higher than those for men. However, it can be argued that comparison of the overall difference in women's and men's rates of labor force turnover fails to take into account the influence of a job's skill level, one's length of service with the employer and the level of pay for the job or occupation. Comparisons of the absenteeism and labor turnover rates of men and women need to be related to those of women and men in comparable jobs and circumstances if they are to be meaningful.
12. T There was a 33 percent increase in households maintained only by women from 1970 to 1976.
13. T If all married women stayed home and unemployed men were placed in their jobs, there would still be 17.3 million unfilled jobs. However, most unemployed men do not have the education or the skills to qualify for many of the skilled jobs held by working women, such as secretaries, teachers, nurses and clerical workers.
14. F In 1960, the average household had 3.3 people and in 1976, 2.9 people. This figure is expected to continue to decline because of a number of factors: delayed marriage, more economic independence among women, an increase in the widowed population and an increase in the number of houses shared by unrelated people.
15. T But when women are placed in positions of responsibility, they cope with job responsibilities in addition to personal or family responsibilities. In 1973, 4.7 million women held professional and technical jobs; another 1.6 million worked as nonfarm managers and administrators. Many others held supervisory jobs at all levels in offices and factories.
16. F A 1976 survey of families reported that even when employed, wives still assumed the major responsibility for household work. Although almost half of today's families have both husband and wife employed, time contributed by husbands and children to household work does not dramatically increase when the wife is employed. (Household work is defined broadly to include all home activities producing goods and services used by the family.) On the average, employed wives spend less time on household work than unemployed wives, but considerably more time than husbands. Both males and females continue in traditional roles, although more females than males are assuming additional roles.
17. F Studies show that many factors must be considered when seeking the causes of juvenile delinquency. Whether or not a mother is employed does not appear to be a determining factor. These studies indicate that it is the quality of a mother's care, rather than the time consumed in such care, which is of major significance.
18. T In 1976, four out of five, or 80 percent of all children under 18, lived with two parents (at least one of whom was a natural parent) compared to 83 percent in 1960. The decline was greater among blacks, with fewer than half living with two parents in 1976. Of the 20 percent who did not live with two parents, most were living with their mothers.
19. T In one study where at least three-fourths of both the female and male respondents (all executives) had worked with women managers, their evaluation of women in management was favorable. On the other hand, the study showed a traditional/cultural bias among those who reacted unfavorably to women as managers. In another survey in which 41 percent of the reporting firms indicated that they hired women executives, none rated their performance as unsatisfactory; 50 percent rated them adequate; 42 percent rated them the same as their predecessors, and eight percent rated them better than their predecessors.
20. T Women who worked full time had median weekly earnings of \$124 in May, 1974. This was about 61 percent of the \$204 reported for men. Between May 1967 and 1974, the median weekly earnings of women in current dollars increased by about 59 percent, from \$78 to \$124. However, when the effects of price changes were removed, the rise in weekly earnings was relatively low. The Consumer Price Index rose by about 46 percent between May 1967 and 1974. Therefore, when measured in dollars of constant 1967 purchasing power, median weekly earnings of women working full time increased by about 11 percent during the period. The gap between women's and men's earnings widened slightly between 1967 and 1974. In 1967 women's typical earnings were more than 62 percent of men's; in 1974 they were less than 61 percent.

Source:

Farris, C.J. *Expanding Adolescent Role Expectations: Information, Resources, Activities for Vocational Educators*. Ithaca, N.Y.: Cornell University College of Human Ecology, 1978.

Reprinted with Permission

FEMALE AND MALE PARTICIPATION IN THE PAID WORK FORCE
AND IN VOCATIONAL EDUCATION PROGRAMS:

WHAT ARE THE FACTS (1977)

Directions: These multiple choice questions are designed to help you assess your knowledge of female and male participation in the paid work-force and in vocational education programs. Under each statement, you will see a number of alternative answers which could fill in the information missing in each statement. Correct answers are given on the next page.

1. Women make up _____ of the nation's paid work force.
a. 26% b. 41% c. 54%
2. For every dollar men earn, women earn _____.
a. 95 cents b. 66 cents
c. 57 cents d. \$1.00
3. The average young woman today can expect to spend _____ years in the paid work force.
a. 7.3 b. 17.1
c. 22.9 d. 31.2
4. Out of every ten young women in high school today, _____ will work for pay outside their homes at some point in their lives.
a. 9 b. 5 c. 7.4
5. Both husband and wife work in _____ percent of the nation's marriages.
a. 35 b. 47 c. 28
6. The median income of working women with four years of college is _____ that of men who have completed eight years of elementary school.
a. greater than b. the same as
c. less than
7. The difference between the average yearly incomes of male and female workers has _____ over the past 20 years.
a. increased b. decreased
c. remained the same
8. About _____ out of ten adult women are either single, widowed, divorced, or separated from their husbands and are therefore responsible for their own financial support.
a. four b. six c. eight
9. Women workers are _____ likely than/as male workers to be absent from work.
a. more b. less
c. approximately as
10. In 1973, the average earnings of white males and females and minority females and males were distributed from highest to lowest in the following order:
a. White males, white females, minority females, minority males.
b. White males, minority males, white females, minority females.
c. White males, minority females, white females, minority males.

11. _____ percent of all women workers are employed in clerical occupations.

- a. 11.2 b. 18.1
- c. 27.8 d. 35.0

12. _____ percent of all vocational education programs had enrollments which were either 90 percent male or 90 percent female in 1972.

- a. 20 b. 32 c. Almost 50

13. The vocational training area with the largest female enrollment (more than one-third of all females enrolled in vocational education) is in _____.

- a. Consumer and homemaking programs.
- b. Occupational home economics.
- c. Office occupations.

14. _____ percent of all students enrolled in vocational education programs in the area of trades and industry are females.

- a. 13 b. 21 c. 34

15. Trends in male/female enrollment in vocational training programs show that _____.

a. Females are enrolling in traditionally male courses at a faster rate than males are entering traditionally female programs.

b. Males are enrolling in traditionally female courses at a faster rate than females are entering traditionally male programs.

c. The entry of males and females into programs nontraditional to their sex is occurring at about the same rate.

(Answers on page 57)

ANSWERS

1. b. 41%
2. b. 66 cents
3. c. 22.9
4. a. 9
5. b. 47%
6. c. less than
7. a. increased
8. a. four
9. c. approximately as
10. b. white males - \$11,633
minority males - \$8,363
white females - \$6,544
minority females - \$5,772
11. d. 35%
12. c. Almost 50%
13. a. consumer and homemaking
14. a. 13%
15. b. Males are enrolling in traditionally female courses at a faster rate than females are entering traditionally male courses.

Published By:

The National Center for Research
in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, OH 43210

Adapted From:

Resource Center on Sex Roles in
Education. Overcoming Sex Discrimi-
nation and Attaining Sex Equity in
Vocational Education: The Social/
Educational and Legal Contexts,
1977.

Reprinted with Permission

More Men Infiltrating Professions Historically Dominated by Women

By CAROL HYMOWITZ

Staff Reporter of THE WALL STREET JOURNAL

When Donald Olayer enrolled in nursing school nine years ago, his father took it hard. "Here's my father, a steelworker, hearing about other steelworkers' sons who were becoming welders or getting football scholarships," Mr. Olayer recalls. "The thought of his son becoming a nurse was too much."

Today, Mr. Olayer, a registered nurse trained as an anesthetist, earns about \$30,000 a year at Jameson Memorial Hospital in New Castle, Pa. His father, he says, has "done an about-face. Now he tells the guys he works with that their sons, who can't find jobs even after four years of college, should have become nurses."

That's not an unusual turnabout nowadays. Just as women have gained a footing in nearly every occupation once reserved for men, men can be found today working routinely in a wide variety of jobs once held nearly exclusively by women. The men are working as receptionists and flight attendants, servants and even "Kelly girls."

The Urban Institute, a research group in Washington, recently estimated that the number of male secretaries rose 24% to 31,000 in 1978 from 25,000 in 1972, while the number of male telephone operators over the same span rose 38%, and the number of male nurses, 94%. Labor experts expect the trend to continue.

Job Availability Cited

For one thing, tightness in the job market seems to have given men an additional incentive to take jobs where they can find them. Although female-dominated office and service jobs for the most part rank lower in pay and status, "they're still there," says June O'Neill, director of program and policy research at the institute. Traditionally male blue-collar jobs, meanwhile, "aren't increasing at all."

At the same time, she says, "The outlooks of young people are different." Younger men with less rigid views on what constitutes male or female work "may not feel there's such a stigma to working in a female-dominated field."

Although views have softened, men who cross the sexual segregation line in the job market may still face discrimination and ridicule. David Anderson, a 36-year-old former high school teacher, says he found secretarial work "a way out of teaching and into the business world." He had applied for work at 23 employment agencies for "management training jobs that didn't exist," and he discovered that "the best skill I had was being able to type 70 words a minute."

He took a job as a secretary to the marketing director of a New York publishing

company. But he says he could "feel a lot of people wondering what I was doing there and if something was wrong with me."

"Kay's New Boy"

Mr. Anderson's boss was a woman. When she asked him to fetch coffee, he says, "the other secretaries' eyebrows went up, and



A research group estimates that from 1972 to 1978, the number of male secretaries rose 24%, telephone operators 38% and nurses 94%. Experts say the trend will continue.

one snidely said, 'Oh, there goes Kay's new boy.' Sales executives who come in to see his boss, he says, "couldn't quite believe that I could and would type, take dictation, and answer the phones."

Occasionally men in traditionally female jobs may find themselves treated as sex objects. Anthony Shee, a flight attendant with US Air Inc., says some women passengers flirt brazenly. "One lady felt compelled to pat me on the rear when I walked down the aisle," he says, "and she was traveling with her husband."

On the other hand, the males sometimes find themselves mistaken for higher-status

professionals. Mr. Shee has been mistaken for a pilot. Mr. Anderson, the secretary, says he found himself being "treated in executive tones whenever I wore a suit."

In fact, the men in traditional female jobs often move up the ladder fast. Mr. Anderson actually worked only seven months as a secretary. Then he got a higher-level, better-paying job as a placement counselor at an employment agency. "I got a lot of encouragement to advance," he says, including job tips from male executives who "couldn't quite see me staying a secretary."

Experts say, for example, that while men make up only a small fraction of elementary school teachers, a disproportionate number of elementary principals are men. Barbara Bergmann, an economist at the University of Maryland who has studied sex segregation at work, believes that's partly because of "sexism in the occupational structure" and partly because men have been raised to assert themselves and to assume responsibility. Men may also feel more compelled than women to advance, she suspects.

Moving Up

Donald Olayer, the nurse, is typical. Almost as soon as he graduated from nursing school, he says he decided "not to stay just a regular floor nurse earning only \$12,000 a year." Now he can look forward to earning three times that much, "enough to support a family on," he says, and he also has "much more responsibility."

Men are more likely than women to see nursing as a full-time career, Mr. Olayer says. He also says the men are more assertive. "Men don't buy the Florence Nightingale garbage they teach in nursing school—that the doctor is everything and the nurse is there just to take orders," he says. "Men will ask questions more and think for themselves."

But in asserting themselves, the males in female-dominated fields may be making life easier for the women, too. "Guys get together and organize and are willing to fight for more," Mr. Olayer says. "Once we get a 30% or 40% ratio of men in nursing you'll see salaries and the whole status of the job improve."

Yet some men don't feel any need to reject the traditional deference of women in doing women's work. Richard Robbin, who last year was named employee of the year by Kelly Services Inc., (formerly Kelly Girls) of Cleveland, says he "doesn't expect to earn a lot of money" or even "get credit for all the work I handle."

Mr. Robbin teaches business subjects in a high school in Vermillion, Ohio, and works as a part-time secretary. He types 90 words a minute and doesn't mind making coffee for his bosses. "I can't understand why some women complain about that," he says.

B. Passing Sex Equity Awareness on to Students: Mechanisms to Turn Awareness into Action

The following exercises are designed to help students follow-up on their strong interests which may in turn lead them into fulfilling careers. The exercises were developed by Mrs. Nancy Cook Cherry, Director of Individual and Adult Programs at the University of Dayton. Mrs. Cherry has extensive experience in designing career and vocational projects for adult women and high school and college students. These exercises can also help students to focus on the career implications of enrolling or not enrolling in specific science or mathematics courses.

The first set of exercises (I) help develop students' fantasies about goals they would like to achieve and increase their understanding of the relationships between career preparations and future achievements. The second set of exercises (II) enable students to learn more about available career options and to develop research skills which will help their exploration of career options and their understanding of the academic preparations necessary for each option.

I. Developing Career Goals

EXERCISE IA: LIFE LINE EXERCISE

Objectives:

- (1) To help students identify their current understanding of life and career goals.
- (2) To provide a mechanism for discussing the relationships between preparations and outcomes.
- (3) To help students focus on course selections which could affect decisions.
- (4) To convey the fact that career choices are up to the individual.

Have students plot their career choices, then post and share them with each other or in subgroups. Ask students to draw a horizontal line on newsprint paper with magic markers; tell them to make the line bold enough to be seen by the whole class. This line will represent a life from birth through retirement. Instruct each student to mark major life events on the line and give the year of the event and then to predict major life events and dates up through the end of the line. Examples might include entering school, part in a school play, first paid job, high school graduation, college, marriage, birthdates of children, significant career points, retirement, etc.

Note: It will help students if teachers or counselors construct their own life-lines and share a portion of their life experiences. Students will find it especially helpful to see how an earlier event influenced a later one; for example, how an early educational or work experience led to a fortuitous turning point in a career, or how a recovery was made from an earlier mistake or difficulty. In the course of the life-line exercise it is important to convey to students that it is okay not to know exactly where one is going but that this exercise can help them focus more closely on what they want or are dreaming of for the future.

EXERCISE 1B: BIOGRAPHICAL SKETCH

Objective: To help students project themselves into the future and to examine the relationship between career preparations and possible achievements.

Current life planning experts indicate that the ability to visualize positive future occurrences can help in achieving these positive experiences. This exercise will assist students in doing some positive future visualization that may help trigger their aspirations.

Have students write a one- or two-page biographical sketch that could be used to introduce them as the keynote speaker at their high school's graduation ceremonies 25 years in the future. The biography should contain their major accomplishments, professional affiliations, schooling, degrees and subject matter specialization, and some personal data about family, hobbies, and major interests.

To help students get ideas, suggest that they think of their favorite hobbies, after school activities, and courses and to envision what kinds of careers could be developed by pursuing these interests. An interest in sports, for example, could lead to a career as a professional athlete, a sports writer, a sports newscaster, manager or owner of a professional team, owner of a sports equipment store, etc. An interest in animals could lead to a career as a veterinarian, owner of a pet store, owner or manager of a race horse or stables, breeder of livestock, researcher for a pet food company, etc.

To help students focus on science and engineering, ask them to think of a technical problem that could be solved through science or engineering and let them work the exercise around their being the creative solvers of the problem. This exercise could be the preliminary to their selection of a science fair project.

To stimulate a student session on sex equity ask them to edit or reexamine their biographies as though they were of the opposite sex to highlight whether they might contract or expand their options if they were a different sex.

II. Researching Career Options

A problem for many students in imagining their future is that they have too little exposure to different jobs and careers. A major research project could be developed to help students get a broader exposure to possible careers and to learn the skills necessary to do additional career exploration. Assignments can be used for individuals or groups.

A good book to provide background for the four exercises which follow is Studs Terkel's Working.

EXERCISE IIA: EXPLORING CAREER OPTIONS

Objectives:

- (1) To experience the elements of choice involved in committing oneself to a career area by having the students examine different work situations and select the most personally appealing options.
- (2) To provide a framework for students to realize the relationship of educational preparations to future work and life styles.

Direct students to select and research two or three areas from Working that are interesting and represent different types of work, educational levels, and life style differences. Have students present a report on characteristics of three very different kinds of work. To increase their exposure to different career choices have them choose one nontraditional job among the three they research.

EXERCISE IIB: EXPANDING CAREER OPTIONS

- Objective:
- (1) To encourage students to broaden their possible career choices within a field of interest.
 - (2) To assist students to narrow their focus to one field and, at the same time, to broaden their recognition of options within a career by investigating important variables for a cluster of career choices.

Have the students select one broad career area (e.g., medicine) and research it in depth including the following points:

- o Note career choices possible and percentages of men and women in each area, e.g., doctor, nurse, medical technician, veterinarian, medical researcher, inhalation therapist, physical therapist.
- o Choose three to five related career choices for further exploration and research. (The student should choose one field that is nontraditional for sex of the researcher, e.g., male nurse; female surgeon.)
- o Outline education required for the three to five different career choices—high school, college, trade, professional, apprenticeship, graduate school, post graduate studies, etc.
- o Discover the competition/projected openings for each of the areas.
- o Note the intrinsic/extrinsic rewards available.
- o Describe the life style inherent in each choice.
- o Outline the career paths possible for each.
- o List the volunteer or high school level jobs that would be helpful in exploring the field.

Exercise IIB (continued)

To broaden everyone's exposure to the career options, the students should share their findings with the class by means of research papers and posters (remember to have them include information on related career choices, education needed, and possible career paths). To enhance the sex equity element of the exercise you might have students develop posters that indicate the differences, if any, between the extrinsic rewards, job openings, economic potential, and career longevity for traditionally male or female jobs. The table below could be used for the sex equity poster reports.

JOBS		
	Traditionally Male	Traditionally Female
Job Title		
Education		
Life Style		
Job Openings		
Intrinsic Rewards		
Extrinsic Rewards		

EXERCISE IIC: ROLE MODEL INTERVIEW

Objectives:

- (1) To experience first-hand the relative merits of a career choice.
- (2) To learn from a working professional which preparations have proven most useful.

Ask students to interview a role model working in a field they are interested in exploring and develop a presentation for the class. In addition to obtaining specific career information, the objectives of the exercise are to help the students identify people working in areas they are interested in, to learn that people like to share information about their jobs, and to discover that other people are important resources in the exploration of career options.

Parents of the students are a likely source of role models. Have students indicate what career area they are looking for and check to see if there are parents who are in that career area. A list of varied career areas could be sent home with a request to parents to help identify themselves, friends, or colleagues that might serve as role models. Students can make contacts through schools, women's organizations, professional organizations, labor/trade unions, etc.

Students should make arrangements to meet the role model for a one hour interview to ask the following questions:

- o What does he/she do at work—on a typical day?
- o How long has she/he been working in the field?
- o What is the next career step, and what are other possible career paths?
- o What background is required to reach current position (in education, previous work experience)?
- o What does he/she like about the job—intrinsic and extrinsic rewards?
- o What are some of the drawbacks?
- o What advice would he/she offer to a high school student interested in entering the field?
- o What volunteer or summer work experiences would provide background information or preparation for a chosen career?

EXERCISE IID: HIGH SCHOOL PREPARATIONS AND COLLEGE CHOICES

Objectives:

- (1) To assist students in planning their high school course work in order to maximize their future career options.
- (2) To help them begin the exploration of college or post high school training.

This exercise focuses on school preparation and post high school training options and is particularly important if there is little post high school guidance available to students in the particular school.

A. Have the students discover and list which institutions (trade schools, apprenticeships, colleges, etc.) would provide the appropriate training in order to enter pre-selected fields.

B. Have students include course work required by selected institutions for entrance into each chosen career.

Classroom and After School Activities

Using the exercises presented earlier in this chapter, the reader can examine his/her own awareness of sex equity issues and that of colleagues as well. Exercises are presented to guide students through some early career planning and to focus on sex-equity issues as a part of the discussion. Now it is time to add realism to that career planning in the form of discussions about the effects of sex-role conditioning and the resultant non-productive attitudes.

In this final list of activities focusing on sex equity, we have surveyed teachers and career counselors for a general list of action oriented suggestions for achieving sex equity. These suggestions are not meant as substitutes for a thorough consciousness-raising session using one or more of the suggested questionnaires but rather as a selection of activities many of which you may implement or adapt at your school.

- o Get the sex equity issue on the agenda at junior high and high school orientations, "Meet the Teacher Nights," and open houses. Promote the whole range of mathematics and science courses and careers for all. If a female teacher does the presentation, all the better.

- o Use students of both sexes for demonstrations and exhibits and for answering questions and doing presentations at open house, orientations, displays, fairs, mall exhibits, etc.
- o Urge students of both sexes to compete in math and science fairs and contests.
- o Make (or have students make) attractive, prominent bulletin board and other displays exemplifying sex equity in math and science careers. Appropriate posters and other materials are available, usually free, from business and industry. Also, the Ohio Department of Education, Division of Vocational Education has an excellent set of posters showing both females and males in nontraditional careers. (See samples at end of this chapter.)
- o Watch newspapers and magazines for articles about women in nontraditional jobs. Have students bring them in for extra credit and then incorporate them into bulletin board displays. Pass extras along to coinstructors and guidance counselors for their displays.
- o Scrutinize textbooks and other instructional materials for sex bias, especially in illustrations. If stuck with slanted materials because of budgetary restrictions, use them as a springboard for discussion regarding "male" and "female" roles and careers.
- o Increase awareness of nontraditional careers:
 - A. Invite a surveyor (with equipment) for a class visit. Be sure that every student uses the surveying equipment.
 - B. Arrange for an automotive or diesel engine to be donated to the class. Have the students use it to discover various principles of ratio, timing, etc. Have everyone in the class get some experience on the engine.
 - C. Have everyone in the class buy a radio kit and build a radio.
 - D. Develop a good working relationship with co-workers and swap classes and equipment; this will expose students to a broader perspective on a given topic. For example, science teachers can teach math students the use of oscilloscopes and math teachers can teach science students how to use micrometers. Imaginative co-teaching can enhance the career education component of instruction.
 - E. Teachers of higher level courses such as trigonometry and chemistry should point out the very specific applications of their courses--surveying, medical technology, etc. Non-traditional resource speakers and field trips are appropriate. Arrange for a "day on the job" with a math/science worker; assign female students to be with female employees. (For more details, see Chapter 5).

- F. Equip classrooms with whatever tools of math and science careers can be found. Some suggestions:

electrical components	micrometers
maps, compasses, dividers	computer terminals
calipers	socket wrenches
stereoscopes	model engines

Resources should only be limited by imagination and the availability of materials.

- G. For pure fun—have a paper airplane or kite designing, building, and flying contest. These activities illustrate math and science principles of aerodynamics, lift, etc., but more than that are fun for both sexes. (If the principal walks in and finds your classroom full of zooming paper airplanes, the resulting publicity could present an opportunity to discuss the equality issue throughout your school.)

With well-informed sex equity and career awareness motivating both teacher and student, the continuing integration of these issues into existing lesson plans should be easy to accomplish. This integration, which is described as the Career Navigation Paradigm, is the topic of Chapter 4.

FIVE ROLE MODELS FOR TEACHERS AND STUDENTS



"All men and women are created creative."
Sid Shore

As students engage in class activities that relate to sex equity issues and study the information on jobs and salaries in various career areas, many will want the opportunity to meet with and ask further questions of role models in these areas. This chapter presents views of four women to provide a variety of perspectives on sex and race equity issues that relate to nontraditional careers.

In the articles, women discuss educational options, nontraditional careers, minority and female questions, the balance of personal and professional concerns, concerns of handicapped students and their teachers, and some of the other issues which face women working in male-oriented careers.

The first article, "Focus on Carol Haag: Welder-to-Be," features a young female welding student (in fact the only female student in her class) enrolled in a vocational/technical school. Her story dramatizes the subtle forces of sexism that can be at work in the high school classroom.

In the second article, "Observations from an Engineer (Who Happens to be a Woman)" Emily Maddox reviews the concerns both men and women have about female engineers. Cartoons illustrate the author's points and make the article an interesting handout.

Education and careers for minorities and handicapped students are the topics addressed in the final three articles--interviews with Grace Mitchell, a university biology professor; and Lilia Abron-Robinson, a professor, civil engineer, and engineering consultant, and Dorothy Tombaugh, nationally known lecturer on "science for the handicapped student." In the first interview Professor Mitchell provides insights into the cultural differences which have limited the educational and career choices of many minority members. Her viewpoints on educating minorities provide important background information for teachers of students of any ethnic heritage.

The second interview, "Wise Words from a Woman Engineer," addresses the concerns of minorities preparing for engineering careers. Like the other articles, this one will make an excellent discussion-starting handout.

The third interview, "Science for the Handicapped Student," contains the advice and experience of Dorothy M. Tombaugh, scientist, educator, and nationally-known lecturer on scientific achievement for handicapped students. Tombaugh presents many ways for teachers to foster a real enthusiasm and even delight in science and math among all students including those who are handicapped. Tombaugh sees handicaps as only individual differences.

Using the Articles

The five articles can serve either as background information from which teachers can devise a complete lesson plan, as ancillary materials for a discussion following a meeting with real-life role models, or as handouts to stimulate discussion about sex equity and nontraditional career issues among students. Sample questions and background information to stimulate discussion follow the first article ("Focus on Carol Haag: Welder-to-Be"). We urge teachers to develop discussion questions similar to these for each of the other articles.

In addition to initiating discussions, the articles can serve as catalysts for other types of activities which will even more vividly illustrate sex equity issues. For example, teachers could assign students to research a famous female, minority member, or handicapped person, who has done the kind of work which might interest individual students. Or students could choose careers in which they are interested, arrange interviews with people in those careers, and write their own articles for the school newspaper or for others in the class. Urge students to be on the watch for newspaper and magazine articles about persons employed in non-traditional areas and to bring these articles to class. Finally, imagination shouldn't be limited to these suggestions. Newspapers and magazines often highlight people in non-traditional jobs. You and your students should be able to compile a rich selection of articles answering the question, what's my line.

A. Focus on: Carol Haag, Welder-To-Be

The special challenge of being a female pioneer in a male-dominated profession is not what turned 17-year-old Carol Haag on to a career in welding. As do most women who choose to enter nontraditional fields, Carol simply loves the work.

It was a happy stroke of chance that led Carol into her first metals shop. Carol's choice of woodshop classes over her friends' choice of home-economics courses opened up different options for her when she entered senior high school. "I looked through the Industrial Arts part of the catalog and saw 'General Metals,' so I decided to take that instead of woodshop for a year," Carol said. "I hardly knew what it was, but my teacher showed me how to weld, and I loved it. Guys can do it; so I thought I could, too. And then he told me how much money I'd be making, so I decided to pursue it a little further."

Her year-long experiment in General Metals thus grew into a long-term career goal. To meet this goal she enrolled at the Montgomery County Joint Vocational School (JVS), where welding dominates her curriculum; she spends three hours per day in laboratory experience and one and one half hours in related classroom instruction. Now in her second year at the JVS, she remains entranced with the type of work she does. "I like being able to weld big pieces of steel together. I like the power behind it," she said. "I think it's a really fun and satisfying experience to have something to show for your work. It's better than typing out forms day after day."

It is unlikely that Carol will ever have to contend with typing forms. Most of her girl friends are enrolled in the secretarial program at the JVS, and although they are supportive of her, Carol wishes they "could trade places with me just for one day to see what it's like." She believes that in the long run her friends may be envious of her nontraditional career if they find themselves in lower-paying jobs.

For now, however, her concerns center around learning the fundamentals of her chosen trade, a trade that has always been dominated by men. As the only female in her welding classes, Carol is something of a trail-blazer whether she thinks of herself in that way or not. And as such, she must deal with the "special treatment" that separates her from the men when she would prefer to be considered an equal among them. For instance, she and her classmates usually take turns hauling a huge metal tub of finished welds to a remote area of the shop. Because her load is too heavy for her to lift, Carol drags it instead. Although she moves the tub very well on her own, inevitably her instructor will tell one of her classmates to "go on over there and give the girl a hand."

Another example of differential treatment occurs each week when the class appointed foreman turns on the manifold--a series of tanks which regulate the supply of gas to the individual welders. "It's a pretty dangerous job," Carol said. "They can blow up at any time. My teacher made a big show of going back there with me when it was my turn to make

sure I knew how to do it. When the guys were foremen he'd send them back by themselves." Equality will be closer at hand when Carol's unique approaches to solving challenges in the work place are more readily accepted by her instructor and peers as viable solutions.

On the whole, however, Carol believes her classmates treat her "pretty much like everyone else." Unfortunately this "regular guy" attitude is not the case in other male-only classes, whose labs she must pass through on the way to her own. Carol describes this passage, and all the wisecracks she must withstand, as "running the gauntlet." Her response is generally to "block it out and keep on going. It's the guys in the class who make the remarks—the teachers act like they don't hear what's going on."

In any group situation, "minority" members are often the unwitting co-creators of their own problems. Carol recalls, for example, the time another division of the JVS sponsored a male-only fashion show during one of the periods usually reserved for welding. Her welding instructor decreed that unless all members of the class went to the fashion show, none could. Carol opted to stay in the welding lab, a decision which prevented the rest of the class from attending and kindled the resentment of her classmates. Even though she was unfairly placed in a position of decision-making for her class, Carol's unwillingness to compromise benefited no one, including herself. As a result, she learned an important lesson: in the future, she will more seriously consider the ramifications of such a decision to herself and her relationship to the group before taking any action.

And although she's still a student, Carol has already had a brush with traditional values in the outside world. "I always look through the paper to see how many welding jobs are open," Carol said. "I saw an ad for a welding apprenticeship program starting at \$4.00 an hour, no layoffs, good benefits, and it gave a number to call. So I called the number, a man answered the phone, and I said, 'I'm calling to find out more about the welding job in the paper.' He said, 'Well, honey, are you calling for your boyfriend or your husband?' It made me so mad, I just said, 'Thank you for your time. I have no more questions', and hung up. I don't think I would have wanted the job."

Carol is well aware of the challenges she will face when she enters the workforce as a welder, and she is prepared for them. "I know a foreman doesn't have authority over a man like a teacher does over a class—he can't really shut someone up if he's saying anything," she said. "I'm going to stay cool and not give them a reaction. There'll probably be some wisecracks, and some people might see me as a woman trying to put them out of a job when they have kids at home to feed, but I'll just try to ignore them. It'll probably be pretty rough to begin with."

Before she graduates Carol will complete a co-op work term in a nearby industry. This job may lead her to permanent employment with that company; but for now she remains flexible, exploring options that range from the automotive industry to underwater welding for the oil rigs off the coast of California, where "electric welding under the water isn't as dangerous as the sharks that are there," Carol said.

Although her determination to succeed as a welder remains very strong, her training path has been a long and, for the most part, solitary experience. When she made her decision to take General Metals there were no role models to prompt her on—no friends who'd made a similar decision, no female welders who could serve as an example to follow. When the JVS held an open house, Carol was glad for the opportunity to show her girl friends the kind of work she does. They, however, were not so enthusiastic. "In the open house I was doing some welding demonstrations and some of my friends came in. When I struck an arc they ran away," Carol said. She believes that women are programmed at an early age to fear heavy machinery. "I think they get that from watching dad in the garage when he says 'get back now—stand back—this is dirty work.'"

Fortunately, Carol herself was not so sheltered, spending much of her youth working with horses, not afraid of the stable grit nor of "wrestling the horses around." Her advice to young women is to "take shop classes, even if you don't want to pursue it as a career. It's always good to know your basic tools, how to fix something you've broken, so you don't have to go running to Daddy or your husband to fix it. I like to fix things myself now, instead. In welding you learn a lot of other things too, things like auto body repair. It's really handy."

And she is optimistic about the future for women interested in pursuing nontraditional careers. "Opportunities are growing in leaps and bounds," she said. "Even in children's books it's showing up. The other day I was looking in the bookstore and there were stories about people in jobs. One showed a woman firefighter." Carol said she is encouraged to see the literature portraying women in the "action" professions rather than showing them assuming "sideline" positions.

About her own future Carol is equally confident. After going through the ranks from tacking assistant through welding apprenticeship to eventual certification, she hopes to make welding her career until she retires. "There is always going to be a demand for welding, whether it be computer welding or manual welding," she said. "Pretty soon the welder is going to be like a computer programmer, programming the weld molds in production." She plans to keep abreast of developments in her field by taking continuing education classes while she's working.

And while she's working, what about marriage and children? "I'm not turned off to marriage or children, but right now I can't see it," she said, "There's a time for everything, but not now." At 17, Carol has plenty of time to plan ahead. For the time being, it's bonds of the welding—not wedding—variety that interest her most.

Questions for Discussion

1. In one instance described by Carol, her instructor invariably sends students over to help her accomplish her tasks. The instructor may or may not be aware of the fact that he is giving Carol "special treatment" by providing help to her. How is this treatment detrimental to Carol's academic and career progress? How does it help to set her apart from the group?

Background Information for Instructor

Some male teachers and supervisors, in their desire to help what they consider to be the "weaker sex," often bend over backward to do so. This is called the "Knight on a White Horse" syndrome: with a sincere desire to help a female employee or student overcome hurdles, male supervisors often unwittingly undermine the woman's competence. This offering of assistance not only creates the illusion of a "damsel in distress," but it also provides a negative role model for male students or employees; they will infer that they too must "come to the rescue" of their female colleagues, or worse, that they must do her work as well as their own, something anyone would resent.

2. How could Carol let her instructor know that she could haul the welds and start the manifold by herself, without alienating him?

Background Information

Carol should be assertive (but not aggressive) in meeting with her teacher to explain that coming to her rescue will help her for the short term but for the long term it deprives her of the opportunity for developing her on-the-spot problem-solving skills. The words must be carefully chosen because the "male ego" may be at stake, but her instructor needs to realize that for long-term growth, Carol must be allowed to fail and know she can survive.

3. Was Carol right in "sticking to her guns" and going against the wishes of the group by not going to the fashion show, thus causing the whole group to miss out?

Background Information

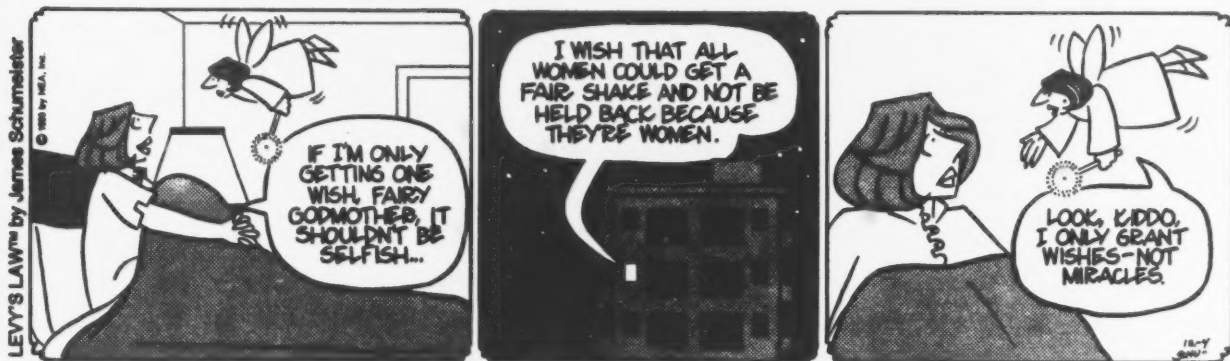
Understanding and dealing with group dynamics is often beyond the level of high school students and, for that matter, of many professionals! However, you might recommend that becoming a part of the group is one of the hardest things for nontraditional students to accomplish. Therefore, on noncompromising issues like going or not going to a fashion show, it might have been better if Carol had acquiesced and rearranged her schedule. Nontraditional employees also need to be cautioned against any actions which might cause their coworkers to ostracize them--a sure sentence to failure in the workplace.

4. Ask your class to suggest other kinds of subtle cases of on-the-job discrimination a nontraditional student might face.

5. In addition to passing laws, what can society do to prevent job discrimination according to race or sex? What could you do in your math or science class to avert discrimination?

B. Observations from an Engineer (Who happens to be a Woman)

In the following article (a presentation delivered by Emily Maddox, a chemical engineer, to the American Society of Engineering Educators, June 1981), the author addresses specific questions some of your female students might have about engineering as a non-traditional career.



Reprinted by permission. (c) 1980 NEA, Inc.

"What's it like out there?" "Are women really treated the same as men?" These are questions I frequently hear from women and men who are interested in engineering. This is what I want to discuss—what it is like to be an engineer who happens to be a woman. What are the perceived and real differences in women, what's changing in industry, and why? What can we do to facilitate needed changes?

Although I cringe when introduced as "a woman engineer," (I hope it is obvious I am a woman) and want only to be "a chemical engineer," I realize that there are some distinctions between engineers who are men and those who are women. I hope that much of the distinction is just imagined and that the day will come when all of us realize this. However, some differences are real and these we need to recognize.

To begin, what are some of the "perceived" differences? Many of the so-called differences I heard when I began engineering eight years ago are now less distinct. For instance, there was the notion that the woman's role should be of support, not leadership; that a man should not have to take orders from a woman. We're told the successful engineer is objective, confident, level-headed, logical, aggressive, and decisive—all traditionally masculine qualities. Females have been classified as too emotional to be good engineers; that women would break into tears if they were criticized or put under pressure. It was believed by some that a woman would want special favors or use sexual influences to get what she wanted.

These are false generalizations about men and women. There can and should be shared personality traits. It's becoming acceptable for a woman

to fix her own car and for a man to enjoy cooking. Traditional masculine and feminine characteristics and the corresponding roles are becoming less defined every day.

However, there is this urge to stereotype—to decide that all women in engineering are as good or as silly, as sharp or as incompetent as the first one that they met. Many people still have not accepted that there is (and should be) a distribution of capabilities, aspirations, and personalities of women just as there are with men. It is so very tempting (and wrong) to generalize about women in engineering. It's not fun to carry the burden of representing all women in engineering, nor to be stereotyped by one that preceded you.

I have seen an encouraging change in attitudes in the past four years. More men today, particularly in the entry-level positions, have worked with professional women. Many of their former biases are leaving as they have a first-hand opportunity to realize their preconceptions are inaccurate. In general, I've also found that younger people find it easier to accept these changing roles for women. They realize the rules are silly.

Women are becoming more knowledgeable about the business world. As they begin to understand the work place through co-op and summer work assignments, role models, workshops and discussions with women in engineering, they learn more effective behavior and dress for the office and the plant. They realize a woman's actions and appearance are very important to the way she is perceived and treated.

Another change I've seen is the job functions in which we find women. In the past, some of the positions typically assigned to women have been in staff departments, often in personnel, customer relations or a research lab, frequently out of the mainstream. Perhaps these were the support functions we would envision for a woman, and the easiest transition for them from school.

But more and more women want to work in the plant, factory floor, or regional sales office. These are the places where much of the action is and women want a part of it. The question is, how are women accepted?

CROCK

by Bill Rechin & Don Wilder



CROCK by Bill Rechin & Don Wilder
(c) 1981 Field Enterprises, Inc.
Courtesy of Field Newspaper Syndicate

There is a world of new problems here. Do the foremen take women's orders? Do the customers still buy from women and request their assistance with problems?

Now we're talking about more complex and subtle problems facing women in engineering. I find that women must work much harder than men to be accepted—with subordinates, peers, and superiors. Women must prove their competence—it will not be assumed. Frequently, it is assumed that a woman got the job only because she was a woman, not because she was qualified. Chances are her work will be double checked and closely scrutinized for errors. Once a woman has proven herself and been accepted, the road is easier. She is then treated as a professional, at least in that assignment.

So gaining acceptance can be difficult. All engineers out of school have to deal with being young, inexperienced, and establishing their credibility. The woman has the added burden of proof of competency. All she has to do is cross her legs, giggle, powder her nose, and she has fulfilled all their stereotypes and is not taken seriously.

What are some other differences? Women often have the additional strain of combining careers with a marriage and possibly a family. Men have been doing both but with support systems, for centuries. Many women feel they must do all that a full time homemaker does in addition to a demanding work schedule. This is known as the "superwoman syndrome." Not all women have (or want) the ability to forget what is going on at home in order to concentrate on their careers. It is difficult to be practiced or confident enough in either area, let alone in both, and sacrifices will have to be made. The guilt feelings can be hard to handle.

CATHY

by Cathy Guisewite



COPYRIGHT, 1977, REPRINTED WITH PERMISSION OF
UNIVERSAL SYNDICATE. ALL RIGHTS RESERVED.

Other differences between men and women are the physical ones. A recent study reported that 85% of women surveyed (not only female engineers) had been sexually harassed on the job. However, only 30% had reported this to their supervisors. Reasons cited for not reporting were because it was the boss doing the harassing; or fear of being fired, ignored, or not believed; or fear of being suspected of encouraging the harasser. We obviously have a lot of educating to do here.

What other observations have I made? I think women aggravate some of the difficulties themselves. Some women treat engineering as a job—a way to make money—and not as a career. Long-range objectives and goals are not established. There are many women in engineering who lack the commitment, perhaps because they don't view a career as a necessity. Gail Sheehy says it best in her book, *Passages*. The chapter entitled "Why Can't Women Be More Like Men and Men Less Like Race Horses?" begins with "Men Must. Women Don't Have To." We've not been conditioned to view a career as an essential part of our lives. We need to be less job-oriented and more career-oriented. We need to set more long-term goals.

CATHY

by Cathy Guisewite



COPYRIGHT, 1981, REPRINTED WITH PERMISSION OF
UNIVERSAL SYNDICATE. ALL RIGHTS RESERVED.

I was not prepared for the working world either. I wasn't ready for the number and percentage of women engineers in the work force. I left a large support group in school and a relatively high number (for the '70s) of women in my engineering classes. The percentage in the work force is much, much less and the support group correspondingly smaller. I had even had a summer job in industry—but in a program for only minorities and women in engineering. I often think that the special attention high school and university women receive to enter and continue engineering studies can be a detriment. They leave much of that support and encouragement at graduation. Many expect the support structure to continue after leaving campus and then have trouble coping even if they find their way to one of the many women's networks now forming across the country. I have some concern that a "women's network" can serve to coddle women, can mask the many frustrating, disappointing aspects of work life which are not unique to women. I fear that formal women's support groups often project

unrealistic expectations. Science is a great place for women—but they must realize that they cannot expect kid glove treatment.

Industry is also becoming increasingly aware of the concerns of women and in some instances initiating formal mentoring networks from within. Companies are also taking a second look at the need to address topics such as dual career management, relocation policies, child care, job sharing, and promotion and evaluation policies. We must all increase our sensitivity to these needs. The future depends on our commitment to permit everyone to develop his or her full potential.

In summary, I feel the real problems many women in engineering face are establishing credibility and gaining acceptance. We still have many well-established stereotypes which persist and are difficult—but possible—to eliminate. Women also need to set goals and priorities for themselves.

All of us need to realize that each woman (and man) in engineering is different—with varying needs and aspirations for a career, recognition, and life style. What we want is the freedom to pursue our goals, whatever they are.

Industry is moving in the right direction and we need to support and encourage their efforts.

We have a long way to go—but look how far we have come!

Author's Comment: Many women have found the support of women's networks a safe place to discuss topics related to women and work that are unique to women: how to reduce the guilt associated with the time pressures of having a career and family, sexual harassment, how to hire a housekeeper, and the pressures of a dual career marriage. For more information on women's networks consult:

Welch, Mary Scott., Networking, Harcourt, Brace, Jovanovich, 1980.

Lipnack, Jessica, and Jeffrey Stamps, Networking: The First Report and Directory, Doubleday & Company, Incorporated, 1982.

Quindlen, A., "Women's Networks Come of Age," New York Times Magazine, November 22, 1981.

For further discussion of some of these points see Author's Preface.

C. Career Education for Minorities: Special Strategies

An Interview with Biology Professor Grace Mitchell

In our next interview, Grace Mitchell, an associate professor of biology at Wilberforce University (who has been educating minorities for the past 20 years) provides extremely important information which you as a teacher may need in order to be responsive to the special concerns of minority and culturally disadvantaged students, particularly when encouraging them to pursue nontraditional careers.

According to Professor Mitchell, minority students who see the societal goal of equal educational opportunity as non-attainable may become disillusioned with the whole idea of education and become reluctant to pursue post-high school studies. Professor Mitchell believes that the disillusionment phenomenon and other discouragement factors act as shut-off valves to higher education and preclude career choices in the technical disciplines. This phenomenon highlights the fact that there are different educational issues for minority high school men and women.

These differences not only affect academic performance but career education choices as well. She contends, for example, that the matriarchal nature of the black family structure better equips its young females to assume responsible roles in society. Among many minority families, the mother is the "official" and only head of the household, providing a very strong role model for her daughters. Also, such mothers may show differential parenting patterns, raising their daughters while they "mother" their sons. All of this leads to the fact, historically proven, that more black females decide early on a career and opt for higher education than do their less assertive brothers.

In the following interview, Professor Mitchell shares her experiences and insights about educating minority students and offers some positive strategies that will benefit teachers of all students, disadvantaged or otherwise.

Interviewer: Do Minority Students in Math and Science Classes Have Particular Educational Needs?

Mitchell: All students need a good sense of self-esteem, but in this society not all minorities develop this in the early years and they may need extra attention. Self-esteem is an extremely important part of success in mathematical and scientific subjects, because the nature of the work often requires students to risk linking with others in team problem-solving situations. For students with low self-esteem it is often easier to work alone, rather than to put ideas before the perceived scrutiny of a group.

In addition, many minorities come from families which may not be well-educated and which are sometimes economically disadvantaged. The problems of navigating the society leave them with negative self concepts, which

result in a lack of self confidence. This lack does not help them when they pursue their studies—to solve a problem they must first know in their own minds that they are capable of doing so, that it is only a matter of using the various techniques they already know (or are learning) until they find the one that works. This demands that they think of themselves as capable and resourceful persons. When they don't, their ability to follow through in individual and/or group problem-solving situations is severely restricted, and that in turn reinforces their negative self-concept.

Interviewer: How Would You Suggest Combating the Problems of Self-Esteem and Self Confidence?

Mitchell: I think a knowledge of one's ancestral history can play an important role in helping a student to realize that his or her people have made noteworthy accomplishments, whatever their race. Too few minority students realize that they have a history to be proud of, and many are often unaware of the important things their forefathers have done. If they were more tuned in to their cultural heritage, they might begin to understand that they too, are capable of notable achievements.

Teachers, upon expressing their expectations of students, should indicate to them (especially minorities) that they are expected to do well in a subject, not just because their teacher or parents want them to, but also because their ancestors have proven time and time again that excellence is possible. This may encourage students to think about themselves in an historic perspective, to see that they might also be remembered in future generations for the work they do now.

If a science or mathematics teacher can provide examples of contributions of minorities to science and engineering knowledge, it's an excellent idea to do so. (If such topics naturally arise in the context of regular class discussion, teachers may impart more than theoretical principles—they may give students confidence as well.)

Interviewer: How Could a Science Teacher, For Example, Incorporate Cultural History Into a Scientific Presentation?

Mitchell: Suppose it happens that you are discussing research that centers around a certain subject, and you happen to know a black contributor: just naturally bring it into the discussion. Of course, you should mention that he or she is black, but don't emphasize the fact. Emphasize the achievement as you would any other scientist's, so the students don't see outstanding achievement as the exception to the rule.

Interviewer: Do Minorities have Difficulty Fitting in with the Mainstream of High School or College?

Mitchell: Not if self-esteem and self-confidence are solid parts of their personality. Sometimes language can be a problem. All ethnic groups have their own colloquialisms. Sometimes minorities find the way they talk at home and the way everyone talks at school sound different, and this awareness can play a large role in diminishing self esteem. When minorities begin to feel that other students can talk in such a manner as to be better understood, they may hesitate to participate, or they may ask fewer questions for fear of being laughed at or misunderstood. This definitely can be a hindrance to getting the technical information and explanations needed to successfully compete in a course.

Interviewer: What Specifically can Math and Science Teachers do to Help these Students?

Mitchell: First, teachers should recognize that accents are fairly normal among people whose ancestors come from different countries. They should encourage students to speak as well as possible. Secondly, they should show their students how understanding directions and good interpersonal communications rely heavily on the proper use of language. The teacher should convey that it is not so much that "I want you to talk like me," as it is "the more we use a common language and the more accurate that language is, the fewer problems we will have." You can appeal to logic rather than culture. Indicate to students that "the reason you need to have an accurately written sentence is so that I, the teacher, may know exactly what you, the student, mean. It eliminates confusion."

Interviewer: Aside from the Language Differences, What Roles do Parental Attitudes and Expectations Play in Performance of Minority Students?

Mitchell: Two things come to mind. First, minority parents may not be able to challenge the developing intellects of their children, who may be receiving a better education than they had. Hence, a minority student may assume that he or she is a lot brighter than may be the case. Or parents, in search of an authority posture, may tend to downgrade the accomplishments of their children.

Secondly, among some less-educated persons, there is a de-emphasis on analytical thinking—they tend more to rely on intuitive approaches to problem-solving. This does not work very well in math and science classes! Parents with strong self-esteem will encourage their children to go on beyond the levels attained by the parent himself.

Interviewer: Do Teachers Themselves Ever Contribute to This Phenomenon?

Mitchell: Indirectly, yes. Often teachers, in their desire to help the disadvantaged student, may give them too much praise for too little work. An insecure person will never gain self-esteem from praise that he or she knows is undeserved: self-esteem is built when good work is expected and performance is rewarded.

ACTIVITIES TO ENHANCE OR DEVELOP THINKING AND PROBLEM-SOLVING TECHNIQUES

If students cannot reason properly, they will be at a serious disadvantage when it comes to solving scientific or technical problems.

We asked Professor Mitchell for suggestions that mathematics and science teachers could use to sharpen the reasoning abilities of their students. Her ideas could easily merit their own volume, but we have condensed them here for classroom use.

I. The Scientific Method:

The scientific process is a very valuable tool for beginning students, as it helps them proceed from a given problem to a possible solution. Make students consciously aware of the scientific method as it is used in classroom and laboratory situations. Label each step used to solve problems. Ask students to adopt this method in their own problem solving:

1. Recognize and state the problem.
2. Collect data or information bearing on the problem.
3. Formulate a hypothesis based on the above data.
4. Test or verify the validity of the hypothesis (Experiment).
5. Correlate all information generated in the experiment or verification step.
6. Draw logical conclusions.
7. Recheck steps for errors.

II. Discuss Inductive and Deductive Reasoning

Another way to have students explore the way they think is to introduce induction and deduction as thought processes.

- A. Define each method and show how information is handled through the ways we perceive and funnel ideas through our thought structure.

Examples:

1. In deductive reasoning one works from a general premise to draw a specific conclusion:

*All Americans are rich.
John is an American.*

Therefore:

John is rich.

Or:

*All birds have wings.
Sparrows are birds.*

Therefore:

Sparrows have wings.

In deductive reasoning, the validity of the conclusion depends on the validity or accuracy of the premise(s).

2. In inductive reasoning one draws a general conclusion based upon specific observed events. For example, one might list a series of events and ask students to draw conclusions based on the events and their mental observations of those events.

Student A kept a bean plant on a windowsill that faced south, hence receiving direct sunlight for a good portion of the day. Students B and C kept their bean plants on similar windowsills.

Student D put her bean plant on a windowsill facing north.

All the students watered their bean plants regularly. After a month, the plants of students A, B, and C were thriving, but student D's bean plant seemed to be doing poorly.

What tentative conclusions can we draw from the evidence above?

In inductive reasoning, depending upon the accuracy of the observation (events observed) one might arrive at new information or be able to predict future situations.

III. Games: Learning games are an entertaining way to get students to practice and compare thinking methodologies.

Examples:

A. Biology or Science "Password"

Student A is given a vocabulary word and must give a one-word clue to that word. Student B must interpret the clue and give the word he or she thinks is being offered. This can be done with one student giving the clue to a group or in a one-on-one situation. The idea is to use vocabulary words particular to the subject to get students to understand them well enough to recognize categories and other subdivisions of word groups.

B. The Match Game

This game requires that one group play against another. The teacher could give a question that has more than one right answer. Each group would be required to answer not only correctly but with answers they feel that most of their teammates would give. Points could be assigned on the basis of whether a majority gave this right answer. Or, as a variation, maximum points could be awarded for the group which lists the greater number of possible right answers. In biology one might ask: "Name a phase of Mitosis." There are five correct answers: Interphase, Prophase, Metaphase, Anaphase, and Telophase. To win points, the majority of a group would have to give one of these. (In the variation, the group would try to name as many of these as possible.)

The results of playing games such as Password and The Match Game include improved comprehension of subject material and increased confidence in such things as "brainstorming" and group interaction to accomplish problem solving.

D. Wise Words from a Woman Engineer

Lilia Abron-Robinson, Howard University Teacher, Civil Engineer, and Consultant, Gives Must-Read Advice to Graduating Students

Lilia Abron-Robinson is an unusual woman with an impressive list of accomplishments, credentials, and honors. She is, for example, one of the first black women to earn a PhD in civil engineering. She was recently elected to the board of directors of the Washington, D.C. section of the American Society of Civil Engineers, and two and one half years ago she started a consulting firm.

Abron-Robinson grew up in Memphis, Tenn., the daughter of two high school teachers. Education and achievement were emphasized in her early years and those of her sisters.

She attended LeMoyne College, then earned her master's degree in sanitary engineering at Washington University (Saint Louis) and PhD in chemical engineering at the University of Iowa. She was only the third woman to earn a doctorate at UI.

During undergraduate school Abron-Robinson directed a girl scout troop and was awarded a Ford Foundation grant to study practical politics at Morgan State University for nine months and an internship on Capitol Hill for a summer.

Abron-Robinson's first goal had been to become a medical doctor, but she did not like dissection or the biological sciences. She was at first discouraged from transferring into engineering because, she was told, black male engineers were having a difficult time finding jobs; a black woman would never find one. She did transfer, however, and after a short stint working for a municipality, she began teaching.

She has combined teaching and consulting, career, and family (she has two boys, six and four years old), plus a dedicated involvement with students and professional societies. She enjoys

teaching and taught first at the University of Tennessee and now at Howard University—for a total nine years—but consulting is also important to her.

In this interview with Graduating Engineer, Abron-Robinson, who first went job hunting in 1970, offers wise words and practical advice to today's graduating engineers.

Q. Are conditions improving for minority engineers?

Conditions are 100% improved for today's graduates. Black engineers, for example, are not so much of an oddity now, and we [black engineers who graduated nine to ten years ago] blazed a trail for today's students. Students have changed as well. The students I'm teaching these days are more qualified, more assertive, and more demanding than any student I ever saw.

It's important, though, for students not to forget our struggles against job discrimination. Gains made by minorities can be lost very quickly—especially in recessionary times. Further, students who have no difficulties getting jobs now may face prejudices in seven to ten years when it is time to move into management positions.

Q. What advice do you give today's engineers?

The advice for any engineer is the same. Do get a variety of experience. Select a first job that will give you field experience. Be wary of jobs that offer only one kind of experience. For example, in large consulting firms, newly graduated engineers are sometimes relegated to a technician's position—providing support to project teams.

An important do: get pregraduation experience. Howard University



Don't think that your first job is everything. A good approach to a first job is to learn; get experience in whatever the firm's specialty is, find out what your likes and dislikes are, and move on.



"The advice for any engineer is the same. Do get a variety of experience."

graduates with cooperative work experience receive higher starting salaries—often with the firm they've co-oped with. In fact, as competition for engineers grows increasingly fierce, Howard is finding that firms are anxious to participate in co-op programs—realizing that it is an efficient recruitment and screening program for their employee needs.

Don't select your first job on the basis of salary. Look for potential. You may be better off accepting a first job with a small firm or with a municipality, where staffs are smaller and recent graduates may get more hands-on experience.

Don't think that your first job is everything. A good approach to a first job is to learn: get experience in whatever the firm's specialty is, find out what your likes and dislikes are, and move on. To become well-rounded, you might stay in each job for two to four years. After a few jobs and seven to ten years of experience, you will know which type of engineering work appeals to you and where your talents are. Then it is time to seek specialized experience.

Q. Do you think today's starting salaries are too high?

I think they are terrific, but they may have an unexpected side effect. With today's very high starting salaries for engineers and competition so great among firms to hire graduates, it is easy for young engineers to have an inflated estimation of their worth as engineers.

Students must understand that they are not, in fact, worth those high starting salaries. A young engineer is

basically raw talent who must be trained. Recent graduates must be taught office procedures, field engineering, how to work on a team—even how to cope with office politics.

Your initial job experiences will be more pleasant and more successful if you are willing to learn, work hard, and keep in mind that your starting salary reflects market conditions more than it does any individual qualities.

Q. How do today's young engineers rate with those of ten years ago?

Although I find today's students more qualified and assertive than in years past, I find that they are also more complacent and less demanding of themselves. To establish oneself in a career, it is often necessary to give more than 100%. That often means taking additional responsibility before a raise or devoting extra hours to a project without being asked and sometimes without credit.

No professional should expect promotions and increased salary just for showing up every day at 9 a.m. and working in a more or less consistent manner until 5 p.m. Career advancement very often depends on how you can prove to be more valuable than the person at the next desk.

Q. Is there less discrimination today than ten years ago?

It's not like the old days. Most recruiters I deal with are open and fair. Most students I encounter, black or white, are more open and have more experience with each other than black engineers and white engineers did 10 years ago. And most firms are so anxious to hire any engineer that they don't care what color he or she is.

However, one piece of advice I think most students, black or white, might find useful is that it is important for recent graduates to fit into the office. Avoid situations and discussions that are obvious sources of confrontation—politics, lifestyles, living arrangements. This doesn't mean that a young engineer must spend years waiting to speak. Not at all. But it is wise first to observe your working environment and co-workers so that you can understand how best to fit into the office.

Q. What can one do about discrimination on the job?

If you have trouble with promotions or supervisors or those you are supervising, don't jump to conclusions. Evaluate the situation first to see if the problem is discrimination. It may be a misunderstanding among those involved—it may also be that you are difficult to get along with or perhaps unwilling to admit to your inexperience.

If, however, you are convinced the problem is discrimination, the next step is to talk to the personnel person assigned to affirmative action or human relations. Another approach might be to discuss the problem with an objective observer—a noninvolved co-worker. However, if after taking the above steps you are still certain that you are the victim of discrimination, you should take action through the affirmative action person in your firm or by contacting EEO the [Equal Employment Opportunity] office.

Q. What are the major problems confronting engineers today?

Engineers need to be more reflective. We sometimes take the team approach too far, and one result is that we don't respect ourselves as individual professionals as much as we might. I think this overemphasis on the team approach is one of the reasons engineers sometimes tend not to consider themselves professionals or realize how influential the profession, which is one million strong, could be in U.S. decision making.

It is important for engineers to understand and be proud that engineering is an essential profession—it affects people's lives. Environmental and sanitary engineering, to use my own specialty, affect the quality of air and water. Engineers are finding ways to clean up and keep clean our surroundings—while still allowing industry to survive.

In recent years I found my better

engineering students were getting master's degrees in business or law degrees because they felt there wasn't enough money or respect in engineering. In my opinion that attitude can only be changed when engineers learn to respect themselves and their profession.

Q. What problems do women face today?

One problem, at least to me, is women professionals opting not to have children. Most of my women students insist that they are not interested in delaying their careers while they stay home with children.

I think it is important for women to do both. Babies are very flexible. Children can always be worked around, and

move, when to wait. It is a very different atmosphere from teaching, but I find the two experiences complement one another.

Q. What are your goals for the firm?

Peer Consultants was two and a half years old in February. We've grown from a firm of 2 to 15. Right now our projects are small—contracts average \$50,000 to \$100,000 with an average length of one year.

My goal is to develop it into a high-technology consulting firm. We specialize in environmental and sanitary engineering studies and design—energy, new pollution control technology, and toxic waste disposal. I want to stay on the edge of technology

known gets more work because it is more visible.

Q. Have any government programs that assist minority-owned firms helped you?

Those programs do exist, but I've yet to see that being a woman or a black in business today has helped me.

Q. What problems do you have running your firm?

I think probably the usual ones. Administration takes more time than I would want it to. As I said earlier, marketing the firm is time consuming and draining. And there are the usual staff problems.

I've found that I have some trouble with both minority and white workers accepting my authority. But I really don't know whether it is my race, my sex, or just a few bad choices of employees.

Q. Is owning your own business worth the effort?

Sometimes late at night I wonder—but by the next day I've decided it is. The firm is something I've created and will hopefully continue to see grow and succeed. That gives me a sense of accomplishment.

Q. Has consulting helped you in your career?

Consulting has broadened my professional experience and outlook—has helped me to become a real-world teacher. And that is important because engineering is first and foremost a real-world profession. On the other hand, teaching has contributed to my role as a consultant. It helps me keep in touch with my peers and their accomplishments, and it keeps me exposed to new students and young engineers with new ideas and fresh approaches to old problems.

Q. What parting advice can you give graduating engineers?

Only that this is a challenging time in which to be an engineer. There are complex problems to be solved in energy, waste disposal, resource allocation—all of which can and probably should be solved by engineers. But solutions to any of these problems (and the many more I've not listed) demand hard work and innovative thinking. I think that for those students willing to make that commitment, the 1980s will be a rewarding decade. □

Ann Seltz-Petrash is a New York City journalist who specializes in technical subjects.



"Don't select your first job on the basis of salary. Look for potential."

neither career nor child needs to suffer. I think it will be too bad if the women of this generation deny themselves the joy of children. Youngsters are important and worth accommodating.

Q. Why did you start a consulting firm?

First, I felt there was a need for a minority firm that offered environmental services. There are many minority firms now specializing in civil engineering, but none concentrating on environmental and sanitary.

Second, I have a strong entrepreneurial streak in me, and you never get rich in government or at a university. So I started the business to make money.

However, I want to point out that a business does not guarantee riches. In any business there is a need to evaluate and take risks and to know when to

and energy and develop the business into a major consulting firm in these areas.

Q. What problems have you faced?

It takes a tremendous amount of energy to launch a new firm. The need to market the firm's services constantly to those who buy them is a real time drain. I must constantly develop new contacts and inform government agencies that we exist and can do a good job. Too many agencies and other engineering establishments assume that a minority-owned firm can't do quality engineering work—that we lack experience. But that is not true.

Also most people (myself included) are naive and assume that all businesses start from the bottom and work up. Of course that's not true. Firms with more contacts get bigger engineering contracts sooner. A firm whose president or members are well-

E. Science for the Handicapped Student

An Interview with Dorothy Tombaugh

This manual considers educational equity from many aspects. Teachers are being asked throughout the text to search for "unusual" or memorable ways of presenting information and interacting with students. Questions such as those in the checklists in Chapter 2 need to be raised continuously if a teacher is to be always alert to equitable pedagogical approaches. But even the most aware teacher may not have considered the case of the visually, aurally, or physically handicapped student. Dorothy Tombaugh, chemistry major, spectroscopist and researcher, secondary educator, and nationally-known lecturer on the subject of "science for the handicapped student," suggests a number of thought-provoking topics to cause all teachers to think more deeply about fostering a real enthusiasm and even delight in science and math among all students, including those who are handicapped.

Tombaugh's own interest in exploring the joys of conveying scientific concepts to handicapped students really began in her own childhood--two of her cousins and her childhood piano teacher were blind. Tombaugh remembers with fondness their working together in the kitchen, and how surprised she was to learn that the blind could handle knives and other types of cooking equipment, information which laid the groundwork for expecting as a teacher that blind students could be trusted to use lab equipment competently. (Tombaugh says, "I was used to blind persons who were successful. One of my blind cousins became a physical therapist, graduating in the early 1920's.") Although Tombaugh did not realize it at that time, knowing and observing these three competent blind people gave her a special awareness and, perhaps, a special ease with the blind students who were to be in her classes many years later. Tombaugh herself says, "My early experiences made it possible for me to accept blindness merely as an individual difference."



Nobody's Perfect

Poster by Klaus Staeck. Used by permission. (from the collection of Robert C. Conard, Ph.D., University of Dayton.)

When Tombaugh taught Biology and Chemistry at Euclid Senior High School in Ohio she was assigned four blind students after several other teachers begged off on grounds of "inexperience." She took two steps which

were to form the basis of her creative and unique expertise in scientific education for handicapped students: 1) she enlisted the skills of her mechanical engineer husband to suggest low-cost ways to adapt existing facilities and devise instructional teaching aids and 2) she challenged all her students to propose ways to "get the ideas across" to the handicapped students.

Tombaugh's husband on one occasion devised some Braille "paintings" to illustrate biological structures and in other situations suggested some easy adaptations of existing laboratory equipment such as cutting off table or chair legs to accomodate specific student differences. Involving other students in designing teaching tools and techniques proved very effective in Tombaugh's experience. One student group constructed a Hydra model using readily available materials--paperbags, streamers, and rubberbands with cardboard arrows. In another student effort, to report on microscope work, a blind student was encouraged to interview all fellow students and to write a summary based on all of the first-hand descriptions. (The blind student had the most complete lab report in the class.)

For all teachers, Tombaugh suggests a list of hints:

1. Concentrate on improved teaching of science in elementary schools.
2. Emphasize (in films, texts, lectures) working scientists who happen to be handicapped. Be sure role model materials show the handicapped students as part of a group.
3. Be enthusiastic about careers in science in general.
4. Emphasize the need for basic skills in communication, math, and science.
5. Encourage parent's support groups.
6. Remember that handicapped students are often reluctant to ask questions. Handicapped people are often shy; few are extroverts.
7. Do not have reduced expectations for handicapped students, treat them like everyone else.
8. Watch the use of the word "handicapped;" it could be associated with mental retardation. (Some experts use the positive term, "handi-capable.")

While many attitudes and physical accomodations have changed for the better over the past few years, Tombaugh says, "There are still certain fears that a handicapped student might be a financial liability, have health problems, be at risk when operating equipment in the work place. I know a man, Director of Handicapped Services, who is also an architect. He designed for handicapped students and created such things as a portable lab chair that was needed for a particular student; the design was so simple that he had it ready the next morning. It really helps to take the simple and often most creative approach to accomodating blind students, often someone is available who can do simple things, for example, saw the legs off a table to shorten it for a student in a wheel chair."

Technology is providing many tools for the handicapped—at any moment an insurmountable problem may have a solution. Because of the rapidly changing technology, teachers (and parents) need to keep current on what is in the works and even knowledgeable about which companies might be willing to "test" new products on current students.

Teachers need to be current on resource people and companies. Martha Redden, Ph.D., of the American Association for the Advancement of Science (AAAS) at 1776 Massachusetts Avenue, Washington, D.C. is an expert in the use of television and film technology with handicapped students. Currently, the AAAS is preparing a three-unit teaching film to break down the barriers to learning for impaired students. Science Products for the Blind of Philadelphia, Pennsylvania distributes talking PH meters and thermometers as well as calculators. Any meter with a digital read-out can be made to "talk."

"Despite parental, teacher and peer encouragement," Tombaugh warns, "sometimes because of a lack of self-confidence or role model encouragement, the handicapped student is his own worst enemy. Information from counseling services is convincing parents that mainstreaming is to their children's benefit. The whole thing is that in order to major in science or engineering, handicapped or not, interest and motivation are the most likely success predictors. Counseling services may need to work with parents and students to overcome some of the protective barriers which have been erected in the name of loving concern."

In Euclid, Ohio, for example, it took the emphatic refusal of parents to send their handicapped students to a special school to make the change. Once a handicapped person learns how to do the work he knows what is expected and what equipment is necessary to get the job done. The government has given incentives to business in hiring handicapped help. Tombaugh remembers a regular column in a Houston paper which lists handicapped people available, describing their conditions and the kinds of work they can do. The various professions listed range from maintenance to management. Handicapped job applicants probably need to learn more about what to hide, what works against them. More training in writing resumes will suggest that they use pictures showing their abilities to do things, will encourage them to interview directly, and will lead to other creative means of proving their skills to a prospective employer.

Teachers who want to be better prepared to work with "handi-capable" students will find the following bibliography, provided by Tombaugh, to be a good starting point. Further assistance could come from parents' groups, research groups in bio-engineering, and even from handicapped support groups.

SCIENCE FOR THE HANDICAPPED - BIBLIOGRAPHY

Blumenkopf, Todd, Swanson, Anne, and Robert Larsen. "Mobility-Handicapped Individuals in the College Chemistry Curriculum." Journal of Chemical Education, 58:213-221, March 1981.

Cain, B. Edward. "Teaching Chemistry to the Hearing Impaired." Journal of College Science Teaching. Vol. 10, No. 6, May 1981.

Crosby, G.A. "Attitudinal Barriers for the Physically." Journal of Chemical Education, 58:205, March 1981.

Crosby, G.A. "Chemistry and the Visually Handicapped." Journal of Chemical Education, 58:206-208, March 1981.

Davis, Cheryl A. and Martha Redden. "Achievement in Biology: An Introduction to Handicapped Biologists." The American Biology Teacher, 40:175-178, 190, March 1978.

Faul, Carol. "Geology as a Career for the Disabled." Hofman, H, editor. A Working Conference on Science Education for Handicapped Students, National Science Teachers Association, Washington, D.C., 167-171, 1978.

Lang, Harry G. "Mainstreaming: A New Challenge in Science Education for the Deaf." Midwest Education Review, 10:13-27, 1978.

Mauer, Marc, Editor. Handbook for Blind College Students. 3rd Ed. National Federation of the Blind, Des Moines, Iowa, 1973.

Redden, Martha Ross, C. Davis and J. Brown. Science for Handicapped Students in Higher Education. AAAS Publication, 1978.

Stefanick, Gregory. "Accepting the Handicapped." Sourcebook: Science Education and the Handicapped, ed. H. Hofman and K. Ricker. National Science Teachers Association, Washington, D.C., 1979.

Swanson, Anne Barrett and Norman V. Steere. "Safety Considerations for Physically Handicapped Individuals in the Chemistry Laboratory." Journal of Chemical Education. 58:234-237, March 1981.

Tombaugh, Dorothy. "Laboratory Techniques for the Blind." American Biology Teacher, 34:258-260, 1972.

Tombaugh, Dorothy. Biology for the Blind. Euclid Public School, Euclid, Ohio 44123, 1973.

Tombaugh, Dorothy. "Mainstreaming Visually Handicapped in Biology." Hofman, H. ed. A Working Conference on Science Education for Handicapped Students. National Science Teachers Assoc., Washington, D.C., pp. 167-168, 1978.

THE CAREER NAVIGATION PARADIGM: HELP STUDENTS CHART THEIR CAREERS



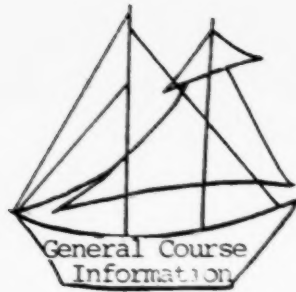
"The job of schools and society itself is to provide an atmosphere in which each male and female can develop fully as a person for the benefit of everyone."

June Heinrich

Integrating career and sex equity information into a course in mathematics, chemistry, or physics could be as complex as learning how to sail; both efforts involve a myriad of related skills which, when well coordinated, will enable the student (or sailor) to negotiate the uncharted waters expertly. Just as the beginning sailor benefits from an overview of the art of sailing which would include information about boats in general, types of sails, importance of weather conditions, and necessary skills in navigation so, too, does the high school student benefit from an introduction to the process of life long career planning.

Just as the would-be sailor can be presented with each facet of information in isolation and then learn how to select an appropriate "tack" to become a successful sailor, so, too, the high school student can be presented with career planning information which includes information about careers in general, types of real life jobs, importance of sex equity issues in career selection and necessary skills needed for a particular career area. The student can learn how course work and appropriate course selection fits into the choice of a rewarding career. To continue the Career Navigation analogy, the teacher can introduce a career planning program that includes four distinct yet related compass points --

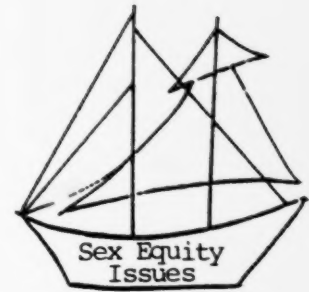
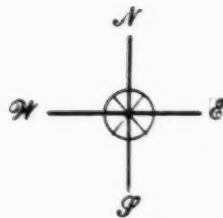
- North
 - o General Career Information (see Chapters 1, 5, 6, and 7)
- South
 - o Examples of Real Life Jobs (see Chapters 3, 5, 6, and 7)
- East
 - o Importance of sex equity issues in career selection (see Chapters 2, 3, and 4)
- West
 - o Relevance of appropriate course selection and general scientific literacy to career selection (see Chapters 2, 6, 8, and 9)



Know Your Boat



Learn How to
Navigate



Check the Weather



Know Your Sails

USE THE CAREER COMPASS TO CHART YOUR CAREER

Let's look at each of these compass points in isolation first and then examine ways to integrate all four points into mathematics, chemistry, and physics classrooms.

NORTH

General Career Information as Part of the Lesson Plan

This information consists of job outlook forecasts, government and industry prediction about job opportunities, methods for assessing personal preferences in work surroundings, geographical location, lifestyle possibilities, hobby opportunities, etc. Chapter 1 which lists job information resources and Chapter 5 which provides personal assessment techniques can both be used to show students the ins and outs of "charting a career."

SOUTH

Examples of Real Life Jobs

Teachers can arrange field trips, career days, and visits by guest speakers/role models. Many suggestions appear in Chapters 5, 6, and 7. Just as the new sailor must learn how different sails and materials can cause a specific boat to win or lose races, so the student must begin to see that various educational and experiential backgrounds, coupled with a sensitivity about one's own personality and psychological makeup can lead a person to a rewarding career rather than an unfulfilling job or series of jobs.

EAST

Importance of Sex Equity in a Classroom Discussion

Young women are perhaps already aware of sex equity issues and the need to be prepared to deal with some of the related obstacles (need for solid academic preparations, assertiveness practice, and consciousness raising); however, the sex equity issue is equally important for young men since it is only when job equity is perceived as an important objective by everyone that fundamental changes in employment policies and practices can occur. True work place equity will require awareness and commitment from both men and women if it is to become a reality.

WEST

Relevance of Course Material

Discussions about course selection and general scientific literacy permeates all science and math classes, but just as that new sailor needs constant reminders from his instructor about boat characteristics, sail settings, and weather conditions while demonstrating and practicing navigation skills, so, too, all students need constant reminders about the importance of understanding the long term career benefits of choosing a "tough" channel rather than an easy one for skillful career navigation. Students need frequent encouragement to choose and stick with the science and math courses which will provide them with "a quiet sea and a following wind," a wide-open selection of majors and/or choices when they begin college or post-secondary work. And, further, even if students do not

major in a science, the basic proficiencies gained at the secondary level will enable them to enter the work world of the 21st century, a world which will demand technological literacy of us all.

Teachers (of sailing or science, mathematics, or physics) must take every opportunity to reiterate the importance of all four compass points in students' career navigation. Offering students an introduction to information about job opportunities and employment issues will automatically increase their awareness and interest in career education and sex equity issues. Teachers can help students further clarify their career concerns by relating the subject matter taught in daily classes to real world applications. One way to use the Navigation Paradigm to make students aware of the connection between present subjects and future careers is to consider the compass points as career focus points: General Career Information, Real Job Situations, Sex Equity on the Job, and Linking Job to Lesson.

The four points of the compass provide a convenient pneumatic device for teachers who wish students to have the knowledge and skills needed to set out on a career. The Navigation Paradigm used here indicates the relative importance of each compass point (or career focus) to the student's smooth sailing into the future. No one compass point is more or less important; rather, all four have equal importance and equal effect on thorough career exploration.

If sailors have general knowledge about boat types, a familiarity with a variety of sails, an understanding of the importance of weather conditions, and a grasp of the fundamentals of navigation, then that sailor is ready to chart a course for a sailing adventure. So, too, the students whose teachers and counselors incorporate the "four compass points" of career information into each course they teach will be well prepared to chart careers for themselves. And, just as with the sailor, the charted destination may or may not be the final stopping place. For both sailors and students, one more island remains to be discovered, one more land calls to be explored. Students are served well if they can set their career course with the knowledge and skills needed to explore, test out, discover, and perhaps settle new lands with a spirit of adventure and creativity.

How to Use the Career Navigation Paradigm

Three Dayton teachers (in mathematics, chemistry, and physics) have volunteered to illustrate how they might focus on a particular "compass point" or how they might indicate the importance of the whole compass in specific classes. These teachers emphasize the four compass directions and demonstrate the importance of discussion and reiteration of all four points throughout each course.

A. Mathematics and the Navigation Paradigm

Today's students should realize that in a society of rapidly expanding high technology, mathematics is no longer the realm of the theoretician. Knowledge and application of mathematics are important in a wide variety of careers including accounting, insurance, technical support, computer systems programming and analysis, engineering and business management. In the following section, Northmont High School (Clayton, Ohio) mathematics teacher Bob Flavin uses the career compass process to introduce sex-fair career education into the mathematics classroom using the concept of the mathematical function.

NORTH

General Career Information as Part of the Lesson Plan

Throughout the discussion of the function, be sure to introduce the real-life function machine--the computer. An ever-increasing number of computer applications can be found in government, business, and industry. Use as an example the power company's monthly meter readings. For each home the power usage figure is fed into the company's computer, and out comes the monthly bill. This is an example of business programming, a rapidly expanding career field. Business programmers maintain financial records, control inventories, process orders, and synthesize data for management decision making. Ask your students to provide additional examples of career areas for business programmers.

Scientific programming is another important computer application. This type of programming seeks answers to scientific or engineering questions. Mechanical engineers use such programming, for example, to assist in designing power generation systems or to build escalators. Electrical engineers use programming to develop power transmission systems or to design integrated microelectronic circuits. Aerospace engineers utilize computers to develop flight control systems or to test new spacecraft insulation materials.

While few high school students are aware of the complexities of computer technology, even fewer are aware of the vast number of engineering fields and their close relationship to mathematics. Few students realize, for example, that the advanced mathematics of differential equations also represents the equations for electrical circuits. Electrical engineering, electronics, computer engineering, even agricultural and petroleum engineering rely heavily on mathematics. In other words, all high school

students need to be adequately informed about the many career areas which involve mathematics. Students must understand the importance of math and science courses as a preparation to enter college programs in any of the math-dependent fields of science and engineering.

Teachers not conversant about different career areas in science and engineering can contact local engineering and/or technical organizations for help. Chapter 7 details how to work with such professional societies to make careers come alive for students.

As an example, in the Dayton area, the Engineers Club of Dayton is deeply committed to the task of informing young students about careers in science and engineering. This very fine organization has written and published two excellent pamphlets describing careers in these fields. These pamphlets are available free of charge to area schools. The Engineers Club of Dayton also sponsors an outstanding summer work program in conjunction with local businesses and industries that provide high school students with summer jobs in engineering-related activities.

SOUTH

Examples of Real Life Jobs

To provide your students with an appreciation of the role of mathematics in business, government, or industry, arrange some real-world experience for them. A visit to a local company's computer center or engineering department should give students a sense of the day-to-day tasks involved and the mathematical skills required in such areas. Most companies willingly host groups of high school students for plant tours. Any such visit should be preceded and followed by well-guided classroom discussions. It is important that the students predict what they might observe and then report what they do observe.

If the proportion of women in the visited company is small, as it is in too many organizations, the follow-up discussion is even more important. Without this discussion, the students' more traditional attitudes may only be reinforced. Mathematics teachers can turn this situation into a positive springboard for discussion of sex equity issues: Why are there so few female engineers? Perhaps not enough women took the prerequisite math courses in high school.

Another way to link career education to your classroom presentations is to involve your students in open houses or career days sponsored by local universities. These institutions may also offer summer engineering or computer institutes for high school students. Become informed of these activities and encourage your students to participate in them.

Be creative in your approach to providing students with real-world experiences in mathematics. Arrange for a career day or shadow program, for example, in which individual students spend an entire day with an engineer, a programmer, or anyone engaged in a math-related occupation. Check with your school's guidance counselors to see if they can help to arrange this type of activity. Programs such as this are often organized through industry initiative. Refer to Chapters 5 and 7 for examples of some efforts initiated by industries and professional societies.

A classroom visit by a female engineer or programmer can also do much to debase the common stereotypes surrounding achievement in mathematics. Don't be surprised to hear your visitor talk about mathematics or her career in explicit, qualitative terms. She does not say, "That main pipe is bigger than the feeder." Rather, she uses the more precise, "The two-inch feeder goes into the six-inch pipe." In so doing, she becomes living proof that females are able to think in mathematical terms as capably as men, and that the stereotypes regarding differential ability between the sexes in this area do not hold true.

EAST

Importance of Sex Equity in a Classroom Discussion

The math classroom is also an appropriate forum for introducing sex equity. An easy transition can be made from the discussions of functions, to the function machine and its analogy to the computer, to the role women can play in nontraditional career areas such as mathematics.

To introduce the topic of sex equity and mathematics, the teacher should point out that mathematics is the gateway to many careers. The mathematics teacher should not allow either male or female students to mislead themselves into believing that if they avoid mathematics, they can still pursue any career they want. (Female students may take some extra convincing.) In Overcoming Math Anxiety, Sheila Tobias indicates that it is common knowledge that fields such as computer programming, engineering, and accounting require mathematics. What is not common knowledge, she adds, is that most of the so-called nontechnical fields also require mathematics, especially at the supervisory and management levels. Management-level decisions are made by compiling, graphing, interpreting, and analyzing data. Decision-making in nontechnical areas is becoming more and more technical. A knowledge of mathematics is essential for entrance into and progression within most careers.

Tobias also contends that women, more so than men, may exclude themselves from these types of careers because of "math anxiety." To alleviate math anxiety in your classroom take the time to openly discuss sex equity. Remind students that to think in terms of stereotypes is a common human failing. The stereotypes surrounding mathematics should then be confronted. Some young women feel that mathematics is a male-oriented activity. Suggest that this conclusion is not based on facts, but on messages transmitted to them by significant others in their lives, possibly by their parents or by other respected adults. Also remind your students that mathematics is neither masculine nor feminine. It is simply a valuable tool used by people in a host of different occupations to solve a wide variety of problems. In all of these occupations, mathematics is a much-needed friend. Encourage your students to stick with it and to leave behind the hang-ups of their past.

Continual encouragement is essential, but it is not enough. Give the female students in your class every opportunity to demonstrate their competence in mathematics. Guard against allowing a disproportionate number of male students to present problems to the class or to lead problem-solving groups. Indicate that your expectations are the same for all students.

WEST

Relevance of Course Material

The concept of the function is one of the most fundamental ideas in mathematics. Simply stated, a function shows the way one quantity depends upon another. For example, the cost of sending a letter depends on the weight of the letter. For each weight there is a single or unique cost. Encourage students to think of their own examples. They may reply that the cost of an ice cream cone depends on the number of dips, or they may answer that the time of a certain trip depends on the speed of the car. Diagrams and graphs can do much to clarify this informal discussion.

The teacher can also use imaginative "what if..." questions to bring home the point: What if each high school student has a locker in one of the hallways? Can the lockers be thought of as a function of the students in the school? (Yes.) If two students must share the same locker, is a function still determined? (Yes.) If one student talks the administration into giving him two lockers, is a function still defined? (No, the dependent quantity must be uniquely determined.)

Another interesting way to introduce students to the concept of the function is to use the function machine (Figure 1). Emphasize that for each number input into the machine, there must be only one number output from the machine. Encourage students to draw their own function machines. As the discussion progresses, the teacher may show that some function machines need "safety valves" to reject input values for which the functions are not defined (Figure 2).

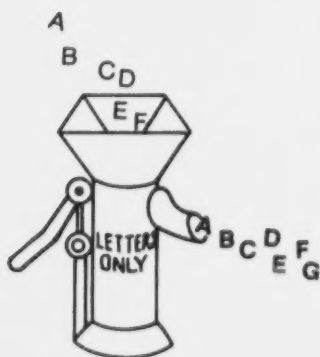


Figure 1: A simple function machine

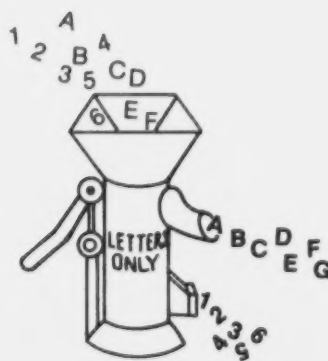


Figure 2: A function machine with a safety valve

B. Chemistry and the Navigation Paradigm

Unlike other careers we have discussed, chemistry is an area which has traditionally appealed to relatively large numbers of women: women have represented approximately 30 percent of the chemistry graduates over the last 20 years. A background in chemistry can lead to a variety of career opportunities that range from research in pharmaceuticals to the development of synthetic fuels. Knowledge about such careers can and should begin in the high school chemistry classroom or laboratory. Applying the Career Compass process will remind a teacher that bringing in career concepts from all directions will add measurably to a student's smooth sailing into the work world.

In the following section, chemistry instructor Eugene R. Egan of Dayton's Northmont High School illustrates how a class session on crystal structures can lead to a discussion of related careers. Through the example of annealing—the heating of metals to alter their chemical composition, and thus their physical properties—he uses the Career Compass to combine effectively the theoretical with the practical. Mr. Egan recommends this presentation as a logical conclusion to a unit on crystal structure and phase changes, particularly if used following a laboratory experiment on atom arrangements in crystals.

NORTH

General Career Information as Part of the Lesson Plan

Having introduced students to materials and metallurgy in the real world of work, ask for examples of ways to connect this information to material to be discussed in the classroom. For example, the discussion of crystal structure and its changes under a variety of conditions can be directly related to methods used to determine the strength and structure of metals needed to meet the specific requirements of industry.

The wide use of metals by industry and the continued search for lightweight, heat and corrosion-resistant products has created many career opportunities in the automobile, aerospace, food processing, and chemical industries. Professionals involved in the design of practical applications of these metals (metallurgists, metallurgical engineers, crystallographers, chemical engineers, process engineers, spectroscopists, and metallurgical technicians) are in great demand.

In your discussion use examples from the field of metallurgy and metallurgical engineering to connect with the presentation of technical material. Explain to your students that there are two main branches of metallurgy: extractive metallurgy and physical metallurgy. The first is concerned with the removal of metal from the state in which it naturally occurs (usually embedded in rock), while the second is more research-oriented, aimed at discovering the physical properties of metals and their alloys, and finding new ways to use them.

Metallurgical engineers are more concerned with the methods by which metals are obtained and produced, a concern which will become stronger as natural resources diminish. A metallurgical engineer might work on the problems of recycling scrap metals or removing impurities from air and water. Engineers in extractive metallurgy continually aim to produce and

refine metals better and more efficiently. In physical metallurgy, the engineer's task is to produce the best possible product for the lowest cost with the least waste.

SOUTH

Examples of Real Life Jobs

A visit to a local company involved in the area of metals would greatly enhance student knowledge of the field, and give them a better evaluation of job conditions and opportunities. This visit could include plants in the automotive industry, metals industry, food processing industry, or aerospace industry, to mention a few. In Dayton, for example, the Duriron Company has been very helpful in coordinating programs. Students who visit Duriron are treated to tours of the plant operations, which include the manufacture of corrosion-resistant pumps, valves, and related equipment for the chemical process industries.

In making arrangements for the field trip emphasize to the company representative your desire to promote sex equity. It would be very desirable if female professionals could be included as tour guides for a plant visit. Seeing a professional at work and being able to ask her questions can greatly improve the students' evaluations of the job situation. Ask the plant representative to provide time for a discussion period at the end of the tour and to make the female professionals available for discussion.

EAST

Importance of Sex Equity in a Classroom Discussion

Chemistry is a science which has traditionally been more appealing to women than fields such as physics or engineering (remind students that it was a woman—Marie Curie—who helped to discover radium and who received a Nobel Prize for her work in radioactivity, a field which overlaps chemistry and physics). This information can initiate discussions of sex equity issues in your class or lab.

Encourage the women in your classes to explore careers in chemistry in areas which interest them. Point out that barriers are being crossed in industry and that qualified women can be as competent on the plant floor as qualified men. Make sure your female students are full participants in your lab experiments and in other group work. Discourage negative remarks regarding their ability that are based on sex stereotypes and biases.

As a connection to the Career Compass, invite a female chemist, metallurgist, or chemical engineer to discuss careers in general and her directions in particular. (To locate such a person, check with the local society of the American Institute of Chemical Engineers, the American Society of Metals, or other related professional organizations, as well as various local industries.) Ask your visitor to discuss her experiences in the field, the type of problems she faces as a female, her opportunities for advancement, etc.

Allow time for open discussion and question-and-answer sessions. The classroom teacher needs to get involved also, not only in discussing job

opportunities and career desirability, but also in openly encouraging female students to explore all of their options. Follow-up procedures would include making all students aware of scholarship and work study opportunities and encouraging women students to compete for these scholarships. (See "Educational Information Centers," Chapter 7, for a list of scholarships and financial aid resources.)

WEST

Relevance of Course Material

To most students, crystal structure is a very abstract concept whose practical application is seen only with great difficulty. As a teacher, you can help to make this concept clear by showing how people in certain professions use their knowledge of crystal structures in their everyday work.

The annealing, or "heat treatment," of metals is one process which can vividly illustrate to your students the practical reasons for studying crystal structure. Explain to them that industries often need to increase the hardness or softness, strength or malleability of certain metals in order to meet various design specifications.

Take iron, for example. In its unannealed state, it is quite hard. When heated, iron undergoes a series of solid phase transformations which can involve changes in crystal structure and which can result in changes in hardness and strength. (A series of overhead transparencies which illustrate these changes is available from the American Society for Metals, Metals Park, Ohio, 44073 (216) 338-5151.) The emphasis should be on the purpose of annealing (which is to produce metals having characteristics needed to suit a particular application in industry by heating to and holding at a suitable temperature followed by cooling at an appropriate rate) and on the change in the crystal structure of the metal (which is one way of producing these characteristics).

Unannealed iron at room temperature exists as a body-centered cubic structure called alpha-iron. (Styrofoam or wooden models, available from Central Scientific Company, 11222 Melrose Avenue, Franklin Park, Illinois, 60131, could be used here to demonstrate how the body-centered structure prevents slippage of the crystal planes, producing a harder material.) Alpha-iron heated to 910°C undergoes a transformation to a softer, more ductile form called gamma-iron. This form has a face-centered cubic structure. Gamma-iron heated to 1400° undergoes a further transformation to a harder form which is a body-centered cubic. Explain that industries will create this same effect by deliberately rolling the iron at specific temperatures, thereby making the transformations permanent and producing either a harder, stronger product, or a softer more ductile product, depending upon their needs.

The phase transformations discussed above can be demonstrated by suspending an iron wire between insulated posts and connecting the ends to a D.C. variable power source (0 - 60v). Iron wire (99.9% pure) is available from Fisher Scientific Company, 5481 Creek Road, Cincinnati, Ohio, 45242. As the voltage is slowly increased, the wire will heat and

undergo the phase transformations from alpha- to gamma- to delta-iron. As the iron wire passes from the alpha (body-centered) phase to the softer gamma (face-centered) phase, it will noticeably sag, but as further heating occurs and it enters the harder delta (body-centered) phase, the wire will become rigid again. You can prevent the wire from melting by turning off the current when it becomes rigid for the second time (gamma to delta). Also, remember that the wire is quite hot and can cause burns. The emphasis, again, is that the properties of the metal have been changed (making it harder or softer or weaker or stronger), by changing the crystal structure.

C. Physics and the Navigation Paradigm

The physics laboratory is another setting in which the Career Compass can be used to balance the areas of theory, career education, job knowledge, and sex equity in the classroom. Dayton physics teacher, Howard Schumacher, describes how he uses the Career Compass Concept to incorporate all four points using as an example the teaching of interference and interferometry.

NORTH

General Career Information as Part of the Lesson Plan

While presenting the principles of interferometry, the teacher can begin to discuss career areas which require a knowledge of these principles. Oil companies, for example, employ petroleum engineers who use acoustical interferometry to determine layer densities surrounding oil deposits. The micro-electronics industry uses classical interferometry to measure film thicknesses in the photo processes used to make silicon chips.

Mechanical engineers often use classical interferometry to accurately measure the flatness of objects (such as machined surfaces), or Moire interferometry to analyze contour. Interferometry is also used by mechanical engineers to measure resultant strain when stress is applied to an object. The Society of Experimental Stress Analysis is an excellent resource for this particular application of interferometry. A nearby branch of the society may be able to provide you with a guest speaker on the subject.

Finally, the general field of optical engineering is one in which interferometry plays a crucial part. Optical engineers are involved, for example, in developing new measurement techniques or new applications of old ones, and in the design of special lenses to meet new measurement needs. Optical engineers are the professionals who developed the hologram, a three-dimensional photographic technique which has important applications in information storage. Optical engineers are often employed by the military to develop infrared viewing and tracking systems, and to research new fields of high energy lasers.

In discussing the careers open to optical engineers, remind students that most of these require an advanced degree. Bachelors degrees in physics, mechanical engineering, or electrical engineering will provide a sound background for later work in optics.

SOUTH

Examples of Real Life Jobs

Tying the concepts mastered in the physics lab to the real world of work can be accomplished in the same manner as in the chemistry example featured above. A site visit to a company that has processes which illustrate principles to be discussed in the classroom, in this instance interferometry, acts as a bridge to illustrate these processes as they are applied to industry.

The Bendix Corporation, for example, is a world-renowned leader in the field of interferometry and metrology as applied to machine control systems. A classroom visit from a worker in such an industry or a visit to a metrology lab such as the ones at Bendix or at a local college or university could probably be arranged. If distance prevents such a visit, literature of a general public nature as well as technical sales brochures from such an industry can be used in the classroom to point out parallels and important dissimilarities between the laboratory application and the industrial application of interferometry.

EAST

Importance of Sex Equity in a Classroom Discussion

In the laboratory setting, the discussion of sex equity can be replaced by more pro-active steps, and biases and stereotypes can begin to be eliminated.

Allow students to form their own lab groups of two or three each, but if there is a definite sexual or racial split, suggest a different mixture of group members. Throughout the year, observe the dynamics of the various groups. Do the women tend to shy away from using the apparatus, performing the role of data-takers on a consistent basis? If this happens, try to encourage those students to be more active participants. If female students see that they can be as adept at manipulating laboratory equipment as their male peers, they will begin to lose the "tool anxiety" that prevents many women from actively following technical pursuits.

Also, when discussing professionals who work with the principles of physics as part of their careers, watch your language! Use of the generic "he" to describe engineers and scientists may seem like a minor issue, but if an equal number of "she's" are thrown into the discussion, male and female students alike will begin to have a more accurate picture of the individuals capable of handling such careers in the future.

WEST

Relevance of Course Material

The multi-colored hues of an oil slick on a city street just after a rain, the iridescent display of colors reflected from soap bubbles, and the coloration of some fish and birds are all examples of the effects of interference of light. These effects are easily demonstrated in the classroom as an attention-getter prior to introducing concepts of interference and interferometry.

Interference is caused by the superposition of two or more waves. Simple overhead projector graphics can be used to show the resulting wave form from the superposition of one wave onto another. Two identical sine, square, or triangular waves can be drawn on each of two overhead transparencies. The concepts of interference, including reinforcement and cancellation, can be vividly portrayed by varying the position of one transparency over the other, thereby controlling the phase. A follow-up demonstration of these same concepts might use slinkies, springs, and vibrating strings.

Other more complex examples of interference can be demonstrated as time and equipment allow. The two-point source pattern from a ripple tank is an excellent demonstration, and its mathematical model is easily developed. Young's classic interference experiment, done with either mono- or polychromatic light, is a good corollary to the ripple tank experience. A certain attention-getter and good illustration of interference in sound waves is to place two speakers about a meter apart from the same audio oscillator/amplifier system. When students walk through the nodal lines they will discover that depending upon where they are relative to the speakers, they will be able to hear the sounds increase and decrease in volume.

For more experiment ideas, see:

1. "Demonstration Experiments in Physics"
(Sutton), McGraw-Hill, 1938
2. "Novel Experiments in Physics"
(American Institute of Physics), AAPT, 1964
3. "Physics Demonstration Experiments," Volumes I and II
(Harry F. Meiners, ED.), 1970
4. "A Demonstration Handbook for Physics"
(G.D. Freer & F.J. Anderson), AAPT

D. How to Expand the Navigation Paradigm:

Initiate a Panel Discussion

To further utilize the Navigation Paradigm in indicating the broad range of career choices and quality-of-work issues embodied in the Career Compass concept, consider initiating a panel discussion. (Panel discussions facilitate the interaction of professionals from diverse backgrounds who can share the nature of their work and the career paths they took to reach their present positions.) Panelists will be able to reveal or emphasize various life directions which brought them to their present careers.

PLANNING YOUR PANEL

I. STRUCTURE

There are two ways to structure a panel to represent a variety of career areas. The first is to arrange a panel discussion that illustrates sequences within career areas and their relation to educational requirements, ranging from the theory-based careers (which often require advanced degrees) to those which are more applied (requiring two- or four-year degrees). The first panelist, for example, could represent a career field in science or research that requires a Masters or a Ph.D. as the terminal degree; a second panelist could represent an engineering or engineering technology area which requires a four-year degree; and a third could be chosen to represent a vo-tech career for which a high school or two-year degree is sufficient.

In a 50-minute class period, such a panel—limited to three representatives from a continuum of career areas—is an excellent way to illustrate a broad range of choices. It may not, however, allow time to discuss the many differences within these fields. To effectively cover these topics, we recommend a second type of panel programming effort—one that operates according to a career planning focus.

In effect, such a focus could take the form of a series of panel discussions that would occur throughout the high school years. High school teachers, counselors, the school board, or the PTA could set up the first panel in the freshman year to deal with the three broad career areas—science, engineering, and vo-tech—and their degree requirements. Panels 2 and 3 held in the subsequent years of high school, could focus on fields within these broad disciplines—chemistry, physics, computer science; mechanical, electrical, chemical engineering; carpentry, welding, electronics, and the tool and die trades.

Each of these career areas deserves treatment by a professional in the field who can answer such questions as "What courses should I take to enter this career? What do employees actually do on this job? How many years of college, if any, will I need to enter this area?" One panel may not be enough to answer all student questions. Therefore consider a longer-range program which includes a series of panels that will allow students to explore diverse career areas.

II. CHOOSING PANELISTS TO REFLECT PANEL CONTENT

To fulfill adequately the goal of describing career choices in many fields as well as to illustrate quality-of-work-life issues, we recommend including female role models who can accurately address these issues. Categories of panelists who can serve both as career representatives and role models include:

1. Married Women: Our experience indicates that a major concern of high school women considering various careers is, "Can I combine a career and marriage? Is it possible to raise a family, be a good mother, and have an exciting career?" Remember this when choosing panelists: if all the female members are single or divorced, they will be asked a multitude of personal questions at the conclusion of the panel discussion. Students may even be motivated away from choosing a career if they receive a subtle message that it's not possible to combine marriage and career.

2. Minority Members: It is crucial to achieve an ethnic balance on panels especially if the composition of the school's student body suggests that minority panelists would be important role models. Male or female, minority panelists can trigger discussions about career choices important to minority members in the audience. Such issues may not come to the surface without a minority representation on the panel.

3. Career Changers: The average adult changes careers from three to five times in a lifetime. Illustrate this reality by including a panelist who has made several career changes before entering her current field. She can remind students that they are not bound to a single career path that they must remain flexible to meet new challenges, and that they can never be sure of which course of action will be most significant to their ultimate career choices.

4. "Persistent Strugglers": Some careers require long years of preparation before a person can enter or achieve recognition for career-related accomplishments. For this reason it's good to include a panelist who can prove that persistence pays off—in advanced education in an assertive posture that results in advancement, in strategic job changes, etc. Career advancement is not simply a given; it requires hard work. Students need to recognize the necessity for different academic or degree requirements when comparing different career areas as well as the importance of career planning to achieve career rewards.

5. Career Planners: Find a chemist, physicist, medical doctor, etc., who can indicate that they prepared a career plan at an early age and followed it. Such role models can be examples of goal-setting in action: men and women who specifically took the harder courses, like mathematics, so that they would not be eliminated from career areas such as engineering. These career planners can indicate to students that now is the time to formulate a career plan by beginning to take the "right" courses.

6. "Late Bloomers": All teachers are familiar with this type of student—the high school ne'er-do-well who later becomes the president of a major corporation. Include such a panelist to show students that it's always possible—and never too late—to start a fulfilling career. So, if they find themselves in their senior year with a burning desire for a career in science or engineering but without the prerequisite science and math courses, they can do what one of our role models did: start out at the community college level and work their way up.

7. Persons Sensitive to Women's Issues: Since one of your overall goals is to achieve awareness of sex equity issues it would be helpful to include a panelist sensitive to women's issues. Ask a professional woman with a knowledge of the historical perspective of women in careers (particularly in nontraditional areas) to act as a panel member. It will do students no good to hear a panelist state that she has always been well-accepted, that everything has been easy, that there have been no challenges, that there is no such thing as male chauvinism, and that discrimination is in the imaginations of a few women. One hundred years of history innumerable court cases, and testimony from thousands of professional women indicate that this is not the case.

A panel must be realistic, but with an overriding attitude of optimism that hopes and dreams for the future can be realized.

III PANELISTS: WHERE TO FIND THEM

Locating panelists is not difficult if you know where to look. Contact local universities, professional societies, and of course, industry and government laboratories when looking for scientists and engineers. When looking for women or minority scientists and engineers, contact the Association for Women in Science and the Society of Women Engineers. (Chapter 7 contains a more detailed description of the services of these professional societies and the ways in which their members may interact with students to provide career information.)

IV. "TRAINING" YOUR PANELISTS

To get panelists to discuss specific areas of student concern, write letters indicating what you would like them to include in their presentations. It is a good idea to send the same letter to all prospective panel members (inform them all that a joint communique is being sent) and address a specific paragraph to each panelist. This practice will avoid duplication of material and each panelist will understand what the other panelists plan to say.

Panel presentations can be real disasters if this preplanning is not carried out; a poorly planned panel can alienate more students than it reaches. Don't take lightly the task of putting together a panel. It is hard work—it takes a skillful career director to bring out the best in panelists.

Don't forget to appraise panelists of the characteristics of the group they will be addressing. Include the size of the group, the sex of its members, their educational backgrounds, their income levels (e.g., is this an affluent group where all parents have the expectation that their children will be going to college, or does a large component of this group have strong interests in vo-tech careers?). The following example may help to illustrate the importance of briefing panelists about their audience.

We once organized a very large panel for a mixed group of high school students and their math and science teachers. The demographics of the group were very complex; it was composed of both minorities and nonminorities from a wide geographic area. Since there was a minority segment in the audience, we chose a minority female speaker as an important role model for the group. But the topics of discussion were less well-coordinated with the composition of the audience: the sensitive nature of the minority-focused discrimination issues coupled with the combative style of the presenter upset some members of the audience. In retrospect, we could have chosen a less sensitive topic or a presenter with a different style for such a mixed audience.

V. FINALLY . . . ARRANGING THE DETAILS

A few final tips on how to make a panel presentation go smoothly:

Although experienced panelists can usually glean information they need about an audience, even when it is not provided for them, there are many last-minute details that will confuse or cause problems for even the most seasoned panelist.

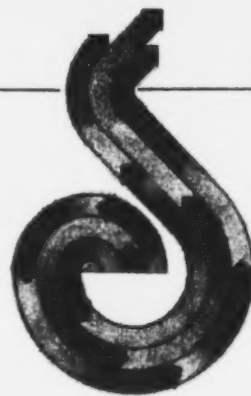
When putting together a panel presentation, it is the organizer's responsibility to make room arrangements that meet the panel members' needs. Place identifying cards in front of speakers so that the audience can remember who said what and can contact them later if necessary. Make sure microphones work and that overhead projectors, carousel projectors, or flipcharts are placed where required. Send speakers a checklist of the

equipment they might need and request biographical sketches so that they can be properly introduced. Taking care of all the details in one effort eliminates the need for follow-up letters and puts the ball in the panelists' court to get back to you with all the necessary information.

A conference call is another way to coordinate a successful panel presentation. In this way each panelist will get to hear first-hand what the other speakers have to say. (Of course, in order to organize a conference call, one of the speakers must be from out of town.) Conference calls are an ideal way to close the communication gap among panelists and panel coordinator and to solve last-minute problems that may become evident during the planning process.

Attending to the details can often make the difference between a mediocre panel presentation and a dynamic interchange that runs with clockwork precision. And well-organized panels will be the biggest selling point when inviting panelists back for later presentations.

THE INDUSTRIAL CONNECTION



"We were all children once."
Sid Shore

A. General Discussion

Industry can act as a valuable resource to bring sex equitable career education into the classroom. This chapter shows how an individual or team of teachers can develop industry contacts that can provide students with accurate career information, insights into the world of work, an appreciation of the work ethic and an understanding of avenues of upward mobility within a career area. Do not be surprised if the industry representatives you meet are eager to help students gain information about their future career options.

Why should industry be so interested in career education? The answer is simple: human resource demand. High technology companies, for example, have shown and projected a constant, if not increasing, demand for well-trained and educated workers. Although many programs have been initiated at the college level to train individuals for high technology careers, if young people are not being informed of such careers, they will neither select nor be prepared to enter these programs. That is where industry comes in: if industry can help to provide this career information—beginning in kindergarten and proceeding through high school—the number of young people selecting technological careers in industry will increase.

Using industry to help tie classroom lectures to real-world problems should help many students make more informed career decisions. In this section, we describe a mechanism for locating, contacting, and working with appropriate industries. Following this general discussion, we detail two programs that utilize industry representatives as co-educators in career programs. These programs, a "Day with Industry" and an "Industry Roundtable," serve as models for adaptation to students' career education needs. Also included are examples of organized approaches initiated by industry to provide career education to students of all ages.

Locating the Right Industry

Let's begin with the assumption that the goal is to identify a company that can provide a plant tour or a "hands-on" semester-long project for a physics, mathematics, or science club. What's the best way to proceed?

As a first step, check with the local Chamber of Commerce. The Chamber will have a list of all industries in an area and a description of the types of industries or government agencies and their purposes--manufacturing, research, or design. Often these lists are available free of charge, simply by contacting the local Chamber's office. Below is a sample listing from the Dayton Chamber, which includes firms' addresses, chief executive officers, Standard Industrial Classification (SIC) codes, number of employees, and types of products or services.

FIRMS EMPLOYING 1001 - 2000

Duriron Company, Inc. (3561)
H.J. Gazeley, President
425 North Findlay Street (04)
P.O. Box 1145
Dayton, Ohio 45401
226-4000

Corrosion resistant pumps,
valves & related equipment
for the chemical process
industries.

Monsanto Research Corporation (2899)
W. Byron Witmer, On-Site Director
1515 Nicholas Road
P.O. Box 8, Station B (45407)
Dayton, Ohio 45418
268-3411

Conduct research, development,
& manufacturing of explosives and
explosive actuated & nuclear
weapon components. Fabrication
of radioactive fueled heat source
for space vehicle lunar power
plants.

FIRMS EMPLOYING 2001 AND MORE

Armco, Inc. (3498)
M.E. Lewis, Manager
1801 Crawford Street
Middletown, Ohio 45042
425-3151

Flat roller carbon steel
products.

NCR Corporation (3573)
W.S. Anderson, Chief
Executive Officer & Chairman
NCR World Headquarters
1700 South Patterson Boulevard
Dayton, Ohio 45479
449-2000

Computer systems and financial
data terminals.
Total business systems.

A second source for information on industries is the State Industrial Directory, published in Ohio by Harris Publishing Company, 2057-2 Aurora Road, Twinsburg, Ohio, 44087. This directory has an alphabetic section listing companies by title, address, and phone. Its industrial purchasing section lists companies by type of product; another section lists companies by geographic area to provide easy access to all companies in nearby counties. Two final sections include a table of industries by Standard

Industrial Classification. Classifications 3675-3679, for example, refer to the electronics industry. Cross referencing these codes with the industries listed in the geographical sections or in the SIC section provides a list of industries in a specific region which are likely to be good resources for career programs.

Working With Industry: A Planning Model

Once the "right" company or governmental agency has been located, the next step is to develop a contact who can help get things going. The ideal situation is to work with an "inside" person who knows the organization. A scientist, engineer, or technician within that organization may be able to save time and energy by cutting through some red tape.

Even without industrial contacts, however, the college relations, training, or personnel divisions are usually helpful. Identify an appropriate contact, present a plan to develop a career education program, and involve the industry liaison in assisting with program design. A cooperative interactive planning effort between high school and industry personnel will result in a more meaningful end product.

This planning process can be discussed in relation to three program results: (1) one time, short-term offerings; (2) ongoing programs expected to last for several years; and (3) programs that involve more than one industry to accomplish program goals. One-time programs that do not involve an extensive time commitment from industry personnel include classroom visits from industry lecturers; demonstrations to science classes, clubs, or student professional societies; or small group visits by students to an industrial site to observe what scientists, engineers, or technologists do. These short or one-time interactions with industry can be planned informally, often with an individual scientist, engineer, technician, technologist, or department within an industry. For these types of programs, an inside technical contact is pivotal because having the right person to talk to a science club or a class can make an important contribution to students' career planning. Formal upper level management approval is usually not required for these shorter programs.

To establish ongoing programs that may be repeated yearly or that involve one or more industries, it is crucial to initiate a more elaborate planning process that makes use of industry contacts in the early stages. Consider the following three-part process which was used over a three-to-four year period to establish an ongoing Women in Engineering Program at the University of Dayton. (This program is discussed more fully in Chapter 6.)

- 1) As a first step form a steering committee with representatives who have a vested interest in the design and implementation of the program: the steering committee for the University of Dayton Women In Engineering Program includes administrators, faculty, industry representatives, and students. Such a steering committee is especially useful when program goals are understood but implementation of those goals is not clear. A steering committee may need to meet regularly for six months to a year as a preliminary step to establishing a new educational program. (It took one year to design the UD Women In Engineering program.)

2) Once the program has been designed and offered as a prototype, continue the work of the steering committee, now an Implementing Committee, as a feedback mechanism to further perfect program design. The program design will continue to evolve even after the initial work of the Steering Committee has been completed. The design of the Women in Engineering program initially included only one industry program module—The Day With Industry component (detailed later in this chapter). A yearly planning meeting with an implementing committee was held two to four months prior to the program the first three years the program was offered. During this meeting we presented program results and provided feedback from student attendees which indicated a student need for more interaction with industry. During one of the early planning meetings we discussed this need with the Steering/Implementing Committee and designed a second educational component, the Industry Roundtable (detailed later in this chapter) as a mechanism for providing career information from a variety of industries to all of the students. The agenda used for one of these planning meetings is shown in Figure 5A.

STEERING/IMPLEMENTING COMMITTEE
Sample Agenda

1. Report from the Project Director on overall success of the program.
2. Individual industry presentations on what their program module (Day with Industry) was like.
3. Interactive small group meetings with three or four faculty and three or four industry representatives to evaluate the success of each program module and to coordinate, revise, and further develop them.
4. Report-back session on the information presented in the small-group discussions. In this session each individual group exchanged ideas on how to improve their program module with the group as a whole.
5. Approval for a new module or program element. As planners saw the need for a new program module, they utilized the steering/implementing committee to take the problem through the creative design phase. After that process the group as a whole discussed the proposed program module and the need for it.

FIGURE 5A

3) Initiate a permanent advisory committee to offer a career education program through a consortia of industries to obtain continual advice and assistance throughout the lifetime of the program, or to utilize the same industries for more than one program. We make a distinction between a steering/implementing committee and an advisory committee, because an advisory committee requires more of a commitment from the school system for its ongoing existence. Often such committees are not used wisely. An advisory committee should be used to provide a more global view of institutional goals and program implementation: it can assist in general curriculum development as well as offer consultation on the development of special careering programs. An advisory committee should have an official capacity and should probably include an executive committee with appointed or elected members. We recommend gaining experience with steering and implementing committees before developing a more formal advisory committee structure.

B. Utilizing Industry: Model Programs

(1) A Day With Industry

If experience is the best teacher, then surely visiting an industry is preferable to learning about it in the classroom. This is the philosophy of a "Day With Industry" program that allows students to spend a full day interacting with engineers, technologists, technicians, skilled and semi-skilled labor employed by a participating industry.

The Day With Industry program has been a feature of the University of Dayton Women In Engineering Seminar/Institute for the past eight years. Each of the industries provides unique learning activities and female role models for the visiting students. A representative from the Inland Division of the General Motors Corporation, for example, transports the students who are to visit her plant in a G.M. test car. While they are at the plant, students actually produce their own foam rubber--the same foam rubber that is used to pad automobile seats.

Automobile headlight lenses are one of the products the women learn about when they visit Corning Glass Works. They take a complete tour of the facility's operations from the processes involved in turning raw materials into molten glass to the final packaging stages. After a break for lunch the students return to the plant where they learn how to use a computer to draw pie charts of the firm's sales volume.

The Hobart Corporation is another industry some of the participants visit. In addition to learning about the industrial food processors that are the firm's specialty, students actually perform tests of pork samples with a meat-content analyzer.

Many of the Women In Engineering participants have reported in their evaluations of the program that the Day With Industry component, with its combination of hands-on activities and female role models, taught them more about engineering and production than did any other part of their week.

A Day with Industry can easily be implemented by high schools that have developed workable contacts with representatives from local businesses and industries. The planning model described in the previous section and the checklist which follows should be useful in adapting a program for a specific locality.

Checklist: Organize A Day With Industry

A. Pre-Event

1. Appoint a steering/implementing committee to organize and carry out the program.
2. Initiate a meeting with your steering/implementing committee to design the content for the Day With Industry.
 - a. Establish a date or series of dates for the program.
 - b. Establish a program format (full-day, half-day, etc.).
 - c. Establish a "hands-on" project that will illustrate what engineers do at each industry.
3. Correspond with the steering committee periodically to inform members of progress in developing the program.
4. Send letters to potential industry participants describing the program and include a return form on which they can indicate the extent of their participation and interest.
5. Establish a final list of participating industries and the contact person at each industry.
6. Send a follow-up letter to all industry participants, summarize the recommendation of the steering committee, and more fully describe the purpose of the Day With Industry.
 - a. Emphasize that the day should be more than a basic tour of operations; students learn more from "hands-on" activities than from lectures or plant tours.
 - b. Mention the importance of providing female and minority role models, where possible, to lead the visiting student groups.
 - c. Ask industry contacts to send descriptive materials about their firms' career opportunities so that students can read them ahead of time and make more informed decisions about which industry to visit.
7. Inform students of the dates and purpose of the program.

8. Post a list of participating industries including the nature of their work and products. Make their descriptive information available to the students. Be sure that students know any specific requirements such as the industry safety code which requires that hard-toed shoes be worn while in a production facility.

B. Event

1. Furnish your industry contacts with a list of visiting students and the composition of the group. Do not send a group of students interested in aerospace engineering to a company whose primary emphasis is chemical engineering.
2. Ask students to indicate first, second, and third choices for their visit to industry according to individual career interests.
3. Assign students in interest groups to specific industries based on their career interests. Try to limit the size of groups to five or six; a herd of twenty or more is not easily manageable within the confines of some industrial or government facilities and at best would receive a cursory tour.
4. Arrange for transportation to and from the industries on the day of the visits. (Our experience indicates that industries are very willing to provide transportation for students.)
5. Coordinate last minute details and offer the program.

C. Post Event

1. Have the students write individual or group thank-you notes to their respective industry guides. Your own letter of appreciation could accompany theirs as a cover letter, or send personal thank-you's to your industry contacts separately.
2. Arrange for a follow-up "rap session" so the students can share their experiences. Encourage students to be specific about both the strengths and weaknesses of their "Day."
3. Provide a summary of student impressions or results of student evaluations to industry participants.

(2) The Industry Roundtable

Think of it as a way to bring the world of engineering and science to your school's doorstep. Call it an "Industry Roundtable," house it in your gymnasium, make it available to your students, and watch their minds begin to open.

The goals of an Industry Roundtable are twofold: to expose students to a wide variety of industries and the career options within them; and to provide important role models for students who might not normally consider such careers, by asking female and minority engineers to represent these industries.

The format is similar to that of a job or college fair: twenty to twenty-five industries can be accommodated in a gymnasium by assigning each an individual presentation area. Tables along the sides of the gym work well for this purpose, as many of the industries will have attractive audio-visual presentations for which electricity and a wall location may be required. In order to optimize the presenters' and students' time, have students rotate from table to table in 15-minute segments; this ensures that all industry tables will be visited and that students will be exposed to several different industries. (Variations on this routine may be desirable; for example, allowing two or three 15-minute sessions for students to visit the presentations of their choice.)

The content of the presentations can be established through pre-event communications with the industry representatives. A typical presentation could include a description of the firm's product; the process in which their product is designed, manufactured, and distributed; the types of engineers or scientists employed by the firm, the work they do and their role in each step of the process; the differences in function between scientists and engineers at their organization; and the high school and college preparation required to enter those kinds of positions.

Any "hands-on" activities the presenters can provide are important teaching aids in the Industry Roundtable. Monarch Marking Systems, for example, in a roundtable sponsored by the University of Dayton, brought along a computer terminal used in their manufacturing process. (Monarch is the primary producer of price labeling devices used in retail establishments.) To allow the students to become familiar with the terminal, the Monarch representatives showed them computer games they could play on it such as "Ski" (a computer simulated serpentine course) and "Biorhythms" (which plots the biorhythms of the user).

Sufficiently impressed, students then learn about the computer's applications in quality control—specifically, how it is used to monitor the different types of test gauges that measure part tolerances, stress, and gum thickness on label paper.

3) Organized Approaches by Industry to Provide Career Education

In the following sections we will describe three career education programs which illustrate industry initiative in action. They are included as further examples of supplemental career education, utilizing the resources of business, industry, and government.

Briefly, these programs are:

A. The Massachusetts High Technology Council—A council of 38 executives from high technology companies throughout Massachusetts to plan and/or augment career education programs, K-12, particularly in the area of high technology.

B. The Summer Science Student Program (SSSP)—A joint venture between Dayton Public Schools and the Monsanto Research Corporation to increase awareness of energy issues by providing summer classwork and employment in energy-related areas. For high school juniors and seniors.

C. The Engineering and Science Careers Program—A comprehensive program, sponsored by the Engineering Foundation of Dayton, to arrange summer internships in research, engineering and technology, and monthly seminars in related career areas throughout the school year. For high school seniors.

A. The Massachusetts High Technology Council

In October of 1977, 38 chief executive officers of Massachusetts high technology companies formed the Massachusetts High Technology Council, Incorporated. The Council's goal, simply put, was to turn a state around. Through the Council, Massachusetts executives looked to the future, embodied in the youth of today, to answer the growing need for science and engineering talent. As a result, a large portion of the Council's efforts go toward promoting and supplementing career education by interacting with schools at all grade levels. This interaction will result, it is hoped, in an upgrading of educational programs throughout the state. Through general classroom presentations, site visits, and summer work internships, this Massachusetts High Technology Council will help to bring the "industrial connection" into the classroom and beyond.

The Council encourages its members and other Massachusetts companies to use a wide variety of strategies to disseminate career information which will vary according to the ages of the students. For kindergarten through eighth grade students, activities include presentations and demonstrations which illustrate the work of scientists and engineers and generate interest in the free enterprise philosophy.

For high school students, the Council companies add other concepts to the basic presentation: quality of work life issues, nontechnical skills development, academic preparation, and other high technology career pre-

requisites (e.g., related skills, abilities, aptitudes and interests). Handouts, audiovisual aids, and anecdotal stories enhance the Council members' presentations.

In addition to these classroom activities, the Council companies also sponsor site visits to member organizations. Interaction among industry members, teachers, and students helps to ensure a meaningful learning experience during these visits. Follow-up student reports (both oral and written) help to reinforce what the students learn during their industry visits and provide valuable feedback to the site visit planners.

Finally, the Council companies utilize internships and summer work to provide students, teachers, and guidance counselors insight into the world of high technology occupations. Internships can take place at any time during the year and provide meaningful experiential learning. Paid or unpaid, an internship may be part of a course or taken in lieu of a classroom-based course. The length of the internship and number of hours per week varies according to the type of company and the nature of student work assignments.

Career Awareness Forums:

Four high technology career awareness forums built into the Council's structure are the key to its success. These regional forums are composed of members who do not belong to the state's Department of Education or to the Council itself; they are independent steering groups with three purposes: 1) to facilitate information exchange; 2) to develop model programs; and 3) to encourage the collaboration of each region's school systems with high technology companies in career awareness activities within a regional master plan.

In essence, the forums pave the way for this "collaboration" to take place through the following tactics:

- o School superintendents and CEOs appoint a regional school/company facilitator. This appointment makes official the career awareness function and provides a go-between for school administrators and company management.
- o Schools and high technology firms are surveyed to compare career education needs to company resources. The forum then matches a number of schools to companies on a local cluster basis and develops a master schedule of high technology career awareness activities through the region. Such pre-planning and promotion will ensure the long-term success of the Council's activities.
- o The forums organize and deliver "Career Awareness/Best Methods" workshops for school and company staffs. To complement this resource, the Council plans to publish an Exemplary Massachusetts High-Technology Career Awareness Program Manual. This manual will describe several in-state programs and show how to connect school systems to companies.

- o The forums, through their own newsletters or those of the Council and associated Regional Education Center, report on activity levels and developing programs.
- o The forums identify economic and organizational issues that could inhibit career awareness activity and use their influence to rally the resources necessary to offset those limitations.

Through these mechanisms the Massachusetts High Technology Council anticipates an ongoing and productive interaction with school systems and students. The council is also eager to share its experiences with those who wish to initiate similar action in other areas of the country. For more information contact:

Massachusetts High Technology
Council
60 State Street
Boston, MA 02109
(617) 227-4855

B. Summer Science Student Program (SSSP)

Another illustration of a successful hands-joined effort between industry and education is the Summer Science Student Program (SSSP). This program was initiated in 1979 through an interagency agreement between the U.S. Department of Energy and the Department of Labor, which contracted diverse organizations throughout the country to design and implement energy awareness career education programs. The Monsanto Research Corporation's Mound Facility, in Miamisburg, Ohio, was one such organization.

Innovation planning and the cooperative effort between Monsanto and the Dayton public schools have made SSSP a unique program that combines energy awareness with academic enrichment. Program goals include:

- o Improving participants' self image
- o Increasing participants' awareness of energy-related issues
- o Motivating participants to continue education and seek careers in energy-related technical, paraprofessional or professional fields.

Program Design:

SSSP is a comprehensive two-and-one-half year program for students identified in their sophomore year as having high academic ability but coming from economically disadvantaged backgrounds. It is organized around an initial intensive summer session followed by two years of after-school employment in a variety of industry and research organizations, follow-up projects, and seminars throughout the academic year.

The first summer session of the program is heavily project oriented; students complete an average of six projects with the help of two or three Monsanto engineers. A sample project would be a series of solar experiments, including the construction of a model solar home (utilizing a heat lamp, electric fan, and water hose to simulate weather conditions); experiments with a solar pond; and the design and construction of solar collectors.

During subsequent school years, students are placed in after school jobs in technology or research-oriented organizations. Some job sites include the Dayton Power and Light Company, Matrix Systems, NCR, and area university science and research labs. Monthly workshops are also held during the school year to explore a variety of topics. Students explore career options in the library during one of the sessions, for example. Other workshop topics include stress management, energy research, and college admissions procedures.

Throughout the program, SSSP students are paid minimum wage hourly rates and transportation costs. They are expected to obey the same rules and regulations a regular job in business or industry would demand in order to better develop a sense of professional responsibility so important to later professional success.

The program's greatest impact lies in the area of career awareness and motivation to pursue technical or energy-related careers. Exposure to a wide variety of workers who represent different levels of skills and interest enables the SSSP participants to make well-informed career decisions. Most SSSP students do make specific job or career goals as a result of the program—choices that include microbiology, computer design, engineering, accounting, health services, and basic research.

Program Organization

School system personnel necessary to staff a program like SSSP include program director, counselor/coordinator, math instructor, science instructor, and communications instructor. The program director oversees the entire project; the counselor/coordinator assists with industry involvement and job placement; and the math, science, and communications instructors help to ensure that the students build a strong foundation of technical and nontechnical skills. (Funding for the SSSP staff has been provided by the Department of Energy grant. However, a school system interested in initiating a similar project could vary the staff and academic design of the program and thus reduce its subsequent cost.)

Industry involvement is a critical element in the SSSP program: supplementing the school system personnel is a pool of 40 volunteers from Monsanto who serve as lecturers and advisors throughout the program. For more information about how your school system might adopt a similar program, contact:

Ms. Myrtle Runyan
SSSP Program Director
4535 Hoover Avenue
Dayton, OH 45417
(513) 268-6754

C. Engineering and Science Careers Program (ESCP)

As a final example of industry initiative in career education, consider the Engineering and Science Careers Program (ESCP), sponsored by the Engineers Club of Dayton Foundation, Dayton, Ohio. Through a combination of interesting summer work situations that provide one-on-one working relationships between high school students and engineers or scientists in industry, the ESCP sponsors hope to motivate qualified high school students to choose engineering or science careers.

Many industries in the Dayton area have joined the program, in order to

- o Further the engineering and science professions
- o Identify high potential engineering and science students
- o Build student/teacher relations with local businesses involved in technology functions
- o Provide jobs and assistance for science students and teachers
- o Assist the education process.

Participating organizations include:

The Dayton Power and Light Company
The Duriron Corporation
Mead Digital Systems
The NCR Corporation
Reynolds & Reynolds
System Research Laboratories
Winter's National Bank & Trust Company
Wright-Patterson Air Force Base
Monsanto Research Corporation
Dayton Reliable Tool & Manufacturing
Technology, Inc.
Phillips Industries

Program Design

In the summer prior to the senior year, ESCP students are employed at one of the sponsoring organizations. They are paid the minimum wage, but more important, they receive personal guidance and supervision from a practicing engineer or scientist. Sheila Pelphrey, a senior from Wayne High School who is an ESCP participant, shares her experiences as a summer employee of Mead at the end of this section.

The summer employment component is followed by monthly seminars throughout the school year. Each sponsoring organization will host the students for the day, giving them plant tours and allowing them to talk with professionals employed in technological careers. At the Dayton Power and Light Company, for example, students met the company's president, viewed demonstrations of the computerized control systems, lunched with DP&L employees, and took a complete tour of the Hutchings Station in Miamisburg. As another example, Mead Digital System's Saturday Seminar covered such topics as the firm's operations, manufacturing, quality assurance, and marketing procedures.

These Saturday sessions give industry the opportunity to broaden students' perspective of the overall functions performed by various organizations, thus broadening the spectrum of possible career choices for these students. In addition, they also give the sponsoring companies a chance to explain their role in the community and to give an overview of their economic structure.

Program Organization

Dayton's ESC Program is directed by a Steering Committee, comprised of several companies' chief executive officers; and a program coordinating committee, comprised of representatives from each sponsoring organization and two Dayton area high school teachers. This committee identifies and places students and develops, monitors, and evaluates the program's overall progress.

Students are selected by the Committee on the basis of achievement and interest in science and math, dedication and leadership skills, and oral and written communication skills. Participants are faced with high expectations from the sponsoring companies. According to Diane Harper of DP&L who chairs the Program Coordinating Committee, "The students have performed with interest and enthusiasm beyond our expectations."

If you are interested in learning more about Dayton's Engineering and Science Careers Program, contact:

Ms. Diane Harper
Coordinator, Community Relations
The Dayton Power and Light Company
Courthouse Plaza S. W.
P.O. Box 1247
Dayton, Ohio 45401
(513) 224-5928

(4) The Engineering and Science Careers Program:
A Student's View

The following are comments by Ms. Sheila Pelphrey, a senior at Dayton's Wayne High School, who is a 1981-82 participant in the Engineering and Science Careers Program.

"The Engineering and Science Careers (ESC) Program was brought to my attention by one of my teachers at Wayne High School. He informed me of the qualifications and application procedures for the program.

Primarily I was interested in this particular program because of my strong interests in math and science. Throughout my high school years I had concentrated on these areas, and felt that many of these talents could be exercised and expanded by this summer program. These expanded interests could be applied later in a career in engineering.

Traditionally women have not sought careers in areas such as engineering which were thought to be men's jobs. It is my belief that as a result of this, much excellent female talent has been overlooked. I think that programs like the ESC Program can give female (engineering) students a chance to develop their talents and abilities in a career that has been a male-oriented one. Although I feel that such a career for women can become a problem in their future if they are considering both a marriage and a career, I definitely feel that this problem can be solved with the proper commitments.

The ESC Program gave me the opportunity to develop my talents and to extend my abilities in general toward a career in engineering through an assignment at Mead Digital Systems.

Mead was a wonderful place to work. The employees were very generous in helping me to learn as much as I could while I was there. I got to work in the Quality Assurance Department where I worked as an aid and inspector. I also learned how to run an ink jet printer, to inspect different incoming parts, to take a company inventory, to run a four-phase computer system, to draw graphs for engineering use, and to use various laboratory and office equipment. In these capacities I was able to question a variety of people in different career areas to find out what they really do. This opportunity helped me to determine the demands and requirements of specific areas, not only in engineering.

The Saturday Program is another essential aspect of the program. Basically this part of the program gives the students a chance to see how many different companies operate and how various employee groups function in the operation of their company. This part of the program taught me what careers are feasible in the Dayton area and indicated some of the companies where those careers could be realized. Thus, I consider the Saturday Programs was a means for exploring opportunities which may aid me in the future."

THE UNIVERSITY AS A RESOURCE: THE UNIVERSITY OF DAYTON/PURDUE RESPONSE

"Wisdom is merely knowing what to do next."
Anonymous



A. General Discussion

Since the early 1970s many institutions of higher education have become aware of the need to attract women to traditionally male dominated career fields, such as engineering. Purdue University and the University of Dayton (UD) are two such institutions. In the following sections four programs, each designed to attract, inform, and retain women and minorities in nontraditional areas, are presented to illustrate important program components, schedules and timelines, budgets, and suggestions for program management.

The four programs detailed more fully later in this section are:

1. The Women in Engineering (WIE) Career Day, Purdue

For high school juniors and seniors and their parents. A one day program that introduces students to engineering through problem-solving techniques. Contains practical hints for planning a similar "day" in another location.

2. The Women in Engineering (WIE) Seminar/Institute,
University of Dayton

For high school juniors and seniors. A week-long program that exposes students to the real world of engineering. Proposes ways to use role models.

3. The Student Science Training Program (SST), University of
Dayton

For high school minority and economically disadvantaged students. A four-week program of classroom and laboratory work followed by a four-week internship in local industry, government, or research laboratory.

4. The Women in Engineering (WIE) Seminar, Purdue

For college women in engineering. A semester-long, one-credit course with a support-group format. Focuses on career planning and tackles the concept of sex-role conditioning which prevents many women from entering non-traditional careers.

Sex equity and career issues come together as primary goals in all four of these programs. Two of the programs, Purdue's "Women in Engineering Career Day" and UD's "Women in Engineering Seminar/Institute," were initiated almost ten years ago. The objectives for these two programs, established at their inception, have remained, for the most part, unchanged. In fact, even though the objectives are not identical, the four programs have a common focus. These objectives can be adapted and augmented to suit students' needs and available resources:

1. To encourage high school and college women and minorities to view engineering as a viable career choice by examining the psychological barriers to entering that field and by dispelling the myth that engineering is a "male-only" profession.
2. To give students an opportunity to meet and interact with female engineers by observing them on-the-job.
3. To allow students to meet female engineering students on a personal basis to discuss the unique contributions women can make to the technological labor market.
4. To expose students to both past and current engineering problems and to the engineering solutions which have benefitted and will continue to have a positive impact on society.
5. To structure "hands on" situations to familiarize students with the engineering approach to problem solving.
6. To familiarize students with admissions and financial aid procedures, undergraduate curricula, and student-life issues.
7. To assist college students in acquiring personal competencies needed to adjust to the demands of an engineering education and career. These competencies include values clarification, decision making, goal setting, time management, and assertiveness training.
8. To make students aware of career possibilities, the inner workings of the corporate structure as well as their own potential.
9. To demonstrate, often through the personal accounts of carefully chosen role models, the variety of ways in which women combine career and family obligations.

B. The Purdue Women in Engineering Career Day

Purdue's Women in Engineering Career Day program is held in the fall in order to be useful to both juniors and seniors as they begin to explore their educational options and to provide the best chance for congenial weather. Scheduling the program on a holiday such as Columbus Day gives non-local students an opportunity to attend.

A brief program for parents who bring their daughters and then wish to stay for the day includes a slide/tape presentation about women in engineering, a question/answer session, and a bus tour of campus. Parents receive a campus map, a recent issue of the school paper, and a handout listing exhibits on campus and location of nearby shopping areas. Parents are also invited to attend the career-day luncheon if they preregister and prepay.

The following sample budget, planning schedule, and career day agenda are provided to illustrate the important activities and planning components in Purdue's program. Each activity within this program is designed to meet one or more of the objectives previously listed. When planning a program remember that linking activities to objectives in this way will help keep out extraneous elements. The sample budget and list of activities can aid in planning a similar program either at a high school or in conjunction with a nearby college or university.

PURDUE CAREER DAY AGENDA

Sunday

- 7:00 p.m. Reception for women engineering panelists,
Society of Women Engineers participants, and
any high school students who have arrived
early

Monday

- 8:00 a.m. Registration (coffee and doughnuts)
9:00 a.m. Welcome and Introductory Comments
9:30 a.m. Engineering as a Career—small group discussions
with professional women engineers
10:45 a.m. Engineering Problems and Solutions—
demonstrations or lectures concerning major
issues in engineering
Noon Luncheon with keynote speaker
1:30 p.m. Group discussions about admissions, residence
halls, financial aid, Freshman Engineering
and student life
3:30 p.m. Tour of campus with student sponsor
5:00 p.m. Student send-off by the Society of Women
Engineers

NOTE:

The most popular element of the program, identified by evaluations, has consistently been the small group discussions with practicing women engineers. The evaluations have also verified that two-thirds of the students plan to attend Purdue University in Engineering and that this decision was influenced by attendance at Career Day. An additional 10-20 percent indicate they were somewhat influenced by the program, but have not made a definite decision regarding college and curriculum. Results of the evaluations, for the most part, have served to confirm the value of a Women in Engineering Career Day in the format presented here.

BUDGET

While some of these items would vary according to location and facilities, these figures should give any program planner a general idea of anticipated costs, based on a registration of 250 students.

Name badges - 300 @ \$.10	\$ 30
Vinyl folders with note pad - 250 @ \$1.50	375
Women in Engineering Pens - 300 @ \$.50	150
Printing and duplicating (4,000 brochures)	450
Buses - 3 @ \$60	180
Flowers - 5 mums @ \$5	25
Sunday reception based on 75	100
Coffee and doughnuts (for registration - 350)	175
Luncheon - 400 @ \$5	2,000
Office supplies	30
Audio Visual (signs and photographer)	30
Miscellaneous expenses	<u>100</u>
Total	\$3,615

PLANNING SCHEDULE

A planning schedule is recommended when a program is being offered for the first time. The Purdue Women in Engineering Day schedule is included here as a sample of the necessary steps in planning a similar project.

Entire year before: Develop mailing list; make physical arrangements (reservations) for registration, meeting, and luncheon rooms based on anticipated attendance.

One to two months before: Bulk mailing to individual students and counselors in Indiana and surrounding states. Arrange for visiting women engineers (three or four for every 30-35 high school students expected); arrange for students to help with registration, introductions, and time keeping, tours, hostessing, etc.; and organize engineering demonstrations (one for every 30 students). Begin weekly meetings with student assistants.

Two to three weeks before: Send confirmation letters to high school students acknowledging receipt of registration forms and giving them final details. Send reminder cards or letters to all students, women engineers, and professors participating in the program. Assign high school students their choice of panel discussions featuring women engineers, engineering demonstrations, afternoon discussion groups, and tours using information on the registration form where appropriate. Make alphabetized list of registrants and their respective high schools. Prepare all handouts to be included in the registrants' folders.

One to five days before: Compute final luncheon count. Arrange transportation needs of students from airport or bus terminal. Begin prayers for good weather.

One week after: Mail follow-up letter and evaluation form to all registrants. Mail thank you notes to women engineers and their supervisors, all professors, staff, and students who helped with the program. (A thank you letter to the supervisors of women who participated on the panel will frequently earn recognition for these women and may assist in locating next year's panelists.)

C. The Women in Engineering Seminar/Institute (UD)

The University of Dayton Women in Engineering Seminar/Institute was also designed to respond to the national shortage of female engineers.

A one-week format was chosen to provide ample time for "hands on" experimentation, interaction with role models, and information sessions for parents. The one-week period also gives industry representatives a chance to act as co-educators by providing experimental situations that illustrate what happens in the real world of engineering and engineering technology. The program, first offered in 1974, was open only to high school women from the Dayton area. Now young women from all over the country come together for the week's activities.

A nationally prominent female engineer begins the week with a keynote address to the students and their parents. The keynote speaker is asked to discuss what it means to be a woman in a profession traditionally dominated by males and to offer students advice about developing their own career plans.

On Monday, the first formal day of the program, the women are given a first-hand look at what engineers do, both on the job and in the college classroom. The students participate in specially designed "hands-on" experiments which illustrate engineering principles. The staff of the chemical technology lab, for example, shows how it is possible to "have your cake and heat it too": after mixing the ingredients for a cake, students attach thermocouples to cake pan and batter, bake the cake, and watch a special computer plot a graph of how the temperature of the cake changes as a function of time.

In the electronics lab, the women take noise-meter reading of sounds that range from chirping crickets and barking dogs to electric drills and cracking pistols. This provides an introduction to the applications of electronics to noise pollution research. After completing their sound

measurements, they are given a chance to explore an anechoic chamber which, when closed, is functionally soundproof.

Because engineers do not spend all of their time in the laboratory, the participants are taken outdoors, where they work on a field surveying problem designed for them by the civil engineering department. Their task is to determine a distance between two fixed points by measuring angles only. After recording their findings, students return to the lab where they can feed their data into a computer. The surveying "team" coming closest to the correct distance is awarded a prize.

A panel of female engineers from local industry, government, and research corporations is included in the program to provide role models of successful women engineers and to counter the psychological factors that have led to adoption of sex role stereotypes. They speak to the students about their jobs as engineers, the special challenges they face, and the skills those challenges demand of them.

Local industry and government installations play an important role in the Women in Engineering Program, both as funders and coeducators. On the first evening of the week, the participants are given a chance to meet representatives of these organizations at the "Industry Roundtable." In a "job fair" setting, formal careering presentations and informal discussions with industry representations introduce students to a variety of career areas, salary structure, and career advancement patterns. The Industry Roundtable "job fair" theme is carried out with industries using displays and brochures to help convey career information. (For a detailed description of the Industry Roundtable and suggestions for organizing one see Chapter 5).

The results of the Women in Engineering program are illustrated in the consequent career choices of its participants. A survey of the attendees over the years indicates the 75 percent of these high school students go on to engineering and engineering technology programs in college. At the University of Dayton itself, the enrollment of women in the School of Engineering has increased from less than one percent in the early 1970's to the current rate of 24 percent. The adoption and implementation of such programs as the Women in Engineering Seminar/Institute will help to ensure a growing number of female engineers and technologists with each graduating class.

Figure 6A provides a graphic overview of the week-long program. Many of the program modules can easily be adapted by high schools to achieve career education goals. Some of the components may take the form of a guest lecture or lecture series, for example. An admissions counselor from a local college could provide valuable information about admissions standards and financial aid; representatives from the engineering departments could provide overviews of their fields; and a cooperative education counselor or even a co-oping student could describe the benefits of combining meaningful work with classroom studies.

For ways to implement other modules, such as the Day With Industry, Industry Roundtable, and panel discussions which may require more planning because they are more complex and must be coordinated with industry, see Chapter 5.

WOMEN IN ENGINEERING: A SEMINAR/INSTITUTE - JUNE 13-18, 1982

UNIVERSITY OF DAYTON

SCHOOL OF ENGINEERING

SUN. JUNE 13

MON. JUNE 14

TUE. JUNE 15

WED. JUNE 16

THUR. JUNE 17

FRI. JUNE 18

BREAKFAST 7:00-8:00 • KENNEDY UNION • EL GRANADA CAFETERIA

8:30 a.m. - Announcements Kennedy Union Room 310	8:30 a.m. - Announcements Engr. Bldg. Room 221 (KL)	8:00 a.m. - Announcements Engr. Bldg. Room 221 (KL)	8:00 a.m. Students Assemble Engr. Bldg. Room 221 BE ON TIME	8:00 a.m. Student Assemble Engr. Bldg. Room 221
8:45-11:45 a.m. GROUP 1 - Departs KU/Room 310 Civil Engineering 8:45-11:30 a.m. GROUP 2 - Panel Discussion "Women in Engineering Panel" KU/Room 310	8:45-11:45 a.m. Experiments in Engineering A - MEE & MET B - IE & IET C - ELE & EET D - CME & CTI	8:15-9:15 a.m. Admission & Financial Aid 9:15-11:45 a.m. Experiments in Engr. C - MEE & MET D - IE & IET A - ELE & EET B - CME & CTI	8:00-8:30 a.m. Industries Depart from KL-221	8:30-11:00 a.m. The Role of the Research Engineer Tour of Research Institute
11:30 a.m.-1:00 p.m. LUNCH WITH PANELISTS AND FACULTY El Granada	11:45 a.m.-1:00 p.m. LUNCH WITH FACULTY El Granada	11:45 a.m.-1:00 p.m. LUNCH WITH FACULTY El Granada	DAY WITH INDUSTRY	11:15-11:45 a.m. Evaluations & Letters to Industries Room 221
1:00-3:30 p.m. GROUP 1 - Panel Discussion "Women In Engineering Panel" KU/Room 310 1:00-4:00 GROUP 2 - Departs KU - 310 Civil Engr.	1:00-4:00 p.m. KL/Room 221 B - MEE & MET C - IE & IET D - ELE & EET A - CME & CTI	1:00-4:00 p.m. KL/Room 221 D - MEE & MET A - IE & IET B - ELE & EET C - CME & CTI		11:45-1:00 p.m. Farewell Luncheon Kennedy Union Ballroom
				1:00-3:00 p.m. Check out at Marycrest main desk

DINNER 4:00-5:00 P.M. • KENNEDY UNION • EL GRANADA CAFETERIA

5:00-5:45 p.m. Check in for girls not staying in dorms Kennedy Union Ballroom	5:00 - Tour of Campus Start at KU	5:00-7:00 p.m. Recreation Period	5:00-6:00 p.m. Recreation	5:00-6:30 p.m. Recreation
6:00 p.m. Parents' Banquet Kennedy Union Ballroom Ms. Jean Hoppert, Maintenance Supervisor M&M Mars	6:30-8:30 p.m. Industry Roundtable Kennedy Union Ballroom	7:30-8:45 p.m. Cooperative Education Panel Kennedy Union Ballroom	6:30-7:30 p.m. Alternative Paths To Engineering Panel Kennedy Union Ballroom	6:30-9:30 p.m. Variety Show Kennedy Union Snack Bar
9:00 p.m. Orientation Lobby, Marycrest Hall Mrs. Nancy Cook Cherry, Project Director	9:00-10:30 p.m. PAC	8:45-10:45 p.m. Bowling, Pool, Electronic Games - Kennedy Union Bowling Alley	7:45-10:30 p.m. Skating Party Kettering Skateland 10:30 - Return to Campus 11:00 - Lights Out	9:30-11:30 p.m. Pizza and Movies Kennedy Union Snackbar

D. Student Science Training Program (SST, UD)

Even though the demand for minorities in engineering is high, they are not as well represented in engineering programs across the country as are women. If minority students choose to go on to college, they are more likely to enroll in nontechnical disciplines. (For a closer look at this phenomenon, see "Career Education for Minorities: Special Strategies," Chapter 3.)

Realizing that positive intervention is an effective way to address this situation, the University of Dayton began the Student Science Training (SST) Program to spur interest in science and engineering fields among minorities and economically disadvantaged students. The SST Program provides an opportunity for high school sophomores and juniors to combine four weeks of classroom instruction and laboratory work with a four-week internship in local industry, government, or research. SST can be considered a model program that links an educational unit such as a high school or university to its surrounding community. The program is designed to provide the students with a detailed academic introduction to science and engineering and reinforcement of that experience in the practical setting of a work environment. Figure 6B outlines the program.

The SST program is offered during the summer before the students' junior or senior high school years. Recruitment begins in the preceding winter, and is directed to the guidance counselors and science and math teachers of the Dayton inner-city schools. Students with real ability in the sciences and math and a commitment to pursue one of these areas are nominated for the program by their teachers or counselors. Selection is by committee review and is based on SAT scores, high school grades, and class rankings.

STUDENT SCIENCE TRAINING (SST) PROGRAM— UNIVERSITY OF DAYTON

Week	1	2	3	4	5	6	7	8
8:15-12:00	Information Seminars: Math, Digital Systems, Women in Engineering, Day w/Industry Tours.		Programs continue for two weeks at Air Force Institute of Technology and four weeks at Wilberforce.					
1:00-3:30	Introduction to Engineering: Civil, Industrial, Mechanical, Chemical, Electrical.		In this six week segment, two social events are planned. At the end of the program, the College Student Panel enables participants to look ahead at college life.					
5:30-on	Career workshops, group study sessions, industry roundtables, panel discussions, and recreational activities.							

Figure 6B

Program Design

During their first two weeks at the University of Dayton, the students receive instruction in a theme area such as mathematics and digital systems; an introduction and overview of major engineering areas—civil, industrial, mechanical, chemical, and electrical; and an intensive problem-oriented project which utilizes a lecture and laboratory format in one of seven areas (biology, biochemistry, aerospace, chemical, civil, industrial, and mechanical engineering).

After the orientation to science and engineering at The University of Dayton, the students move on for two weeks at the Air Force Institute of Technology, located at the Wright-Patterson Air Force Base, where they continue the problem-oriented projects in computers, nuclear physics, engineering, and energy conversion.

The SST Industry Component

After this rigorous four-week introduction to science and engineering, the students are well-prepared to enter the work world for the internship component of the program. To ensure that students' interests are matched to the type of work being carried out at an industrial site, the SST internship coordinator works closely with the industry, government, and research sponsors who act as hosts.

It should be noted that these internships are not "busy work" for the SST students; nor are they charity positions provided by the sponsors. The tasks the SST students complete are important and necessary to their employers. One student, interning at the Monsanto Research Corporation, designed and carried out an ion-exchange experiment; another student analyzed employee absenteeism as part of an industrial engineering assignment at a General Motors division. In addition to the valuable experience they gain, SST participants are also awarded a stipend for their work during the latter half of the program.

If the students are pleased with the work experience, their supervisors are no less impressed. Comments from supervisors have been extremely favorable; some employers have promoted their SST students to Research Apprentices and asked them to remain throughout the school year.

A career orientation component is also an important part of the SST program. The careering component begins with a motivational and career planning session and concludes with a panel discussion featuring engineers and scientists. During these sessions, students are introduced to the importance of "networking," college preparation, financial aid resources, and decision-making skills.

The results of the programs have been gratifying: follow-up surveys indicate that 80 to 85 percent of SST graduates go on to enroll in science, medicine, and engineering programs in colleges and universities across the country.

Involvement As A High School Teacher in Pre-College Career Awareness Programs

If you are thinking of designing all or a portion of a career awareness program such as the University of Dayton's or Purdue's Women in Engineering Program or a minority focused program such as SST, get the support of the school board and recruit community support from industry or local universities. University faculty and industry representatives will appreciate advice from high school teachers on what to expect from students and how to manage them. The Dayton School Board assigns one of the area's better physics teachers as coordinator to develop the industry internships for the University of Dayton SST Program.

In addition to serving as internship coordinator/consultant, other ways a high school teacher might become involved in career awareness programs include identifying appropriately qualified students to attend programs operated by local universities; serving as a liaison between a school system and potential industry and government sponsors to garner community support; and helping to design program curricula based on a knowledge of the abilities of high school students.

The basic goal of programs like WIE and SST—to combine academic learning with real-world experience—can be achieved in many ways. You, as a high school teacher, can become the motivating force behind a similar program in your own school or district.

E. Women in Engineering Seminar (Purdue)

In addition to pre-college career awareness programs, Purdue continues to battle sex equity issues at the college level. Purdue offers a one-credit, semester-long course primarily for freshman students in the School of Engineering. The course fills in gaps in the background of students who may not have had the "hands-on" experiences which are so important to success and even survival in an engineering program and later in an engineering job. Specific sessions of the course are designed to meet the overall goal of acquiring personal competencies needed to adjust to the demands of an engineering education. This goal is accomplished through objectives previously introduced in this chapter.

A representative fourteen-session course plan follows:

Seminar Sessions: Women in Engineering

Session 1—Present course objectives, requirements, content. Have students complete information sheets for class rosters (include freshman math and science courses they are presently taking). Show a film, present a visiting woman engineer, or introduce other information to raise questions or concerns to be addressed during the course.

Session 2--Discuss history of women in engineering. Present research regarding women in engineering from a historical perspective.

Session 3—Begin series of personal skills sessions (to be continued in sessions 6 and 15). Include time management, study skills, assertiveness training, life planning, and decision making. Use guest speakers for some of these topics where appropriate.

Session 4—Present role models from several disciplines of engineering and various work settings. (To be continued in sessions 5, 7, 8, and 11).

Session 5—Role model. (See 4 above)

Session 6—Personal skills. (See 3 above)

Session 7—Role model. (See 4 above)

Session 8—Role model. (See 4 above)

Session 9—Use a co-op student panel to present the advantages and disadvantages of co-oping based on personal experiences.

Session 10—Focus on the value of graduate work in a technical area. Use guest speakers to emphasize the need for advanced work in specific jobs. Address the advantages and disadvantages of pursuing a graduate degree directly following undergraduate work or after gaining some work experience.

Session 11—Role model. (See 4 above)

Session 12—Present speakers who have followed a nontraditional path within engineering. Use a panel to show how some women use their technical degrees in consulting, law, medicine, education, etc.

Session 13—Present dual career couples to share their experiences in managing careers, relationships, and family responsibilities.

Session 14—Define and discuss professionalism.

Course Requirements

In Purdue's course, students are expected to attend each session and contribute to discussion. The importance of this requirement is stressed because the benefit of the class to the students depends on every student's full participation.

Students are required to keep journals in which they make weekly entries of their reactions to the sessions. They are asked to include both evaluations of the sessions and some reflections on the meaning to them personally. Summaries of the sessions are not acceptable. Journals are collected and read at midsemester and the end of the semester.

Finally, students are asked to submit a final paper (three - five pages) on one of the following topics:

1. A description of a company's structure. Visit a company which employs engineers, jot down observations during the visit, and record reactions as to how one might fit into such a work setting.

2. An investigation of an alternative career area for engineers (e.g., law, medicine, sales, politics).

3. A book report on Games Mother Never Taught You by Betty Lehan Harrigan, The Ropes to Skip and the Ropes to Know by R. Richard Ritti and G. Ray Funkhouser or other books approved by the instructor.

Miscellaneous Suggestions

1. The speakers are chosen for the WIE Seminar at Purdue very carefully to meet certain criteria. An attempt is made to get a broad range of engineering disciplines, ages, family situations, work settings, experiences, and examples of career plans, etc.

1. The film used in the opening session, "A World for Women in Engineering," even though produced by AT&T several years ago, still makes valid points. It serves as an excellent basis for discussion and the formulation of questions which students may want to raise with the visiting women engineers. Check film listings for other appropriate material.

3. A student evaluation form can be very useful in planning subsequent courses. A sample evaluation form (Figure 6C) may suggest some items to include on an adapted form. We recommend that students complete this form both before and after taking the course. This pre- and post-evaluation will allow students to measure their own growth and provide additional evaluative information for the instructor.

FIGURE 6C

Student Ratings of Importance and Achievement of Course Goals

Pre-Course Question: How important is each goal to you personally?

Directions: Prepare two copies of Figure 6C—one to be administered on the first day of class, the other on the last day. Have students examine course objectives on the first day of the course. Have students rank the top ten objectives in order of personal importance.

Post-Course Question: How useful has this course been in helping you to meet each goal?

Directions: Have students evaluate the success in meeting each objective during the last week of the course. Now have students rerank the top ten objectives in terms of personal importance. A comparison of the two ratings makes a good discussion topic on the last day of class.

	Rank	Very	Quite	Some- What	Not At All
A. To understand just what engineers do on the job	_____	_____	_____	_____	_____
B. To learn the variety of ways women incorporate work into their life style	_____	_____	_____	_____	_____
C. To acquire the personal skills needed to adjust to the demands of an engineering education	_____	_____	_____	_____	_____
D. To raise your awareness of your own potential	_____	_____	_____	_____	_____
E. To be exposed to the different types of jobs available to engineers in the various disciplines (e.g., EE, ME, ChE)	_____	_____	_____	_____	_____
F. To see the variety of ways in which women manage to combine work with marriage and/or children	_____	_____	_____	_____	_____
G. To become motivated to acquire the personal skills needed to meet the demands of a college engineering major	_____	_____	_____	_____	_____
H. To acquire the personal skills needed to adjust to the demands of a future engineering career	_____	_____	_____	_____	_____

I. To have contact with women
employed as engineers

J. To learn about the current and
past state of affairs of women
in engineering

K. To learn more about the inner
workings of the corporate
structure

YOUR COMMUNITY AS A CAREER EDUCATION RESOURCE

"The community is a fountain of resources that provides equal opportunity for men and women to drink from its reservoir of knowledge."

Carol M. Shaw



In this chapter we describe three model community career programs and a state-wide career information database that provide sex-equitable career information to teachers and students. The programs are both publically and privately funded and illustrate what can be done in a particular region when career education becomes a priority. The particular programs and services described are examples from the Dayton, Ohio area; we suggest that these examples could easily serve as models to facilitate career education in any community.

The community examples are as follows:

- o Honor Seminars, Inc.: A description of an ongoing seminar series conducted for selected high school juniors and seniors by local professionals who volunteer their services. The goal of the series is to motivate students to explore a wide variety of careers in science, mathematics, and technology.
- o Professional Societies: A discussion of the role of the technical society in providing career information to students. Included are specific examples of such organizations and suggestions on how best to utilize them.
- o Ohio Career Information System (OCIS): A subscription service offered to school districts at a reasonable cost through the Ohio Department of Education.
- o The Community College and Career Education: A description of Dayton's Sinclair Community College shows how well-planned programs can stimulate interaction between high schools and community colleges to provide sex- and race-equitable career information.

A. The Honor Seminar Series: A Comprehensive Community Volunteer Program

By tapping the expertise of volunteers from education, business, industry, and government, communities can provide valuable educational services to students. An example of this type of "volunteer" approach to career education is a program called the Honor Seminars of Metropolitan Dayton—a unique seminar series that enlists the aid of local professionals to provide ongoing education for gifted students from all high schools in Montgomery and Greene Counties. The fundamental philosophy of the Honor Seminars series is to help the gifted student, through the donation of services of professional persons. It is the program's goal to expose such students to advanced achievements in the sciences, technology, and humanities so they will be motivated to continue to explore areas of specific interest on their own.

According to Dr. Lerroy Jones, chairman of the program's Board of Directors, the Honor Seminars were initiated in the early 1960s to satisfy a need for advanced educational opportunities for above-average students. The Dayton Chamber of Commerce supported the program for its first two years to provide a sound organizational base. However, within that two years the Honor Seminars, Inc. was able to take off on its own.

Approximately 300 students are nominated each year for the Honors Seminars by administrative and guidance personnel. Students who complete application forms are evaluated by a selection committee of The Board of Directors. Because of the rigorous requirements for attendance at each seminar, between 25 and 30 percent of the original nominees decline to submit applications for admission. The group is further reduced to approximately 100 applicants by committee evaluation of grades and test scores. A final pool of 100 candidates is interviewed to produce a group of 30 to 35 of the community's most promising students. These students, having survived the rigorous screening process, are ready to undertake a two year program of "brain stretching" sessions that will challenge their unique capabilities.

The seminars are held one evening a week for two hours at the industry or organization of each week's seminar leader. Each weekly session explores a new professional or career area. A representative of the American Cancer Society, for example, might discuss cancer research; energy specialists might introduce solar energy systems; a physicist might lead a demonstration and discussion on lasers; and university scientists and mathematicians might address fundamental topics related to their fields. These topics are selected by the Honor Seminars Board's Vice President who is responsible for the junior seminar series. The senior seminars are devoted to introducing students to the fundamental technological issues in career areas such as medicine, space travel, computer technology, surgery, and biomedical engineering. Also, for the seniors, seminars are held in economics, local and national government, and major development and manufacturing operations. The President of the Board selects the senior topics to maintain continuity from the previous year.

Further career information is passed along as students linger after the sessions to chat with the seminar leaders about opportunities in their

respective fields. This informality allows the students to become acquainted on a one-to-one basis with professionals in various career areas. These chats have the added advantage of often leading to summer jobs. The experts themselves are no less enthusiastic. One seminar leader—a leading heart specialist—was so dedicated to the program that he instructed his staff to, put through to him, if at all possible, any telephone calls related to the Honor Seminars. The community commitment to the program ensures a continuous supply of eager and well-qualified seminar leaders representing a host of disciplines; from astronomers, biochemists, mathematicians, and medical doctors to aeronautical engineers, energy consultants, computer systems designers, and international finance specialists.

Contact with these experts is extremely important because it serves to make the students aware of the fact that intellectual prowess is a desirable achievement, well worth attaining. And intellectual achievement seems to run rampant among the program's graduates, most of whom go on to graduate studies through the doctoral level in areas related to the interests they discovered through the Honor Seminars program.

High school or college teachers planning a career education program on their own with meager resources can take heart from the success of this Honor Seminars Program which utilizes all volunteer professional help. To initiate a similar program, contact a Chamber of Commerce, local industry leaders, and university and college faculty. It might also be beneficial to work through a school board. If you can organize an industry committee that approves and is willing to sponsor the idea, long term, low-cost way for many of your students to get valuable career education first-hand from experts in the field will have been set in motion.

For more detailed information on the specifics of Dayton's program, contact:

Honor Seminars of Metropolitan Dayton, Inc.
140 E. Monument Avenue
Dayton, Ohio 45402

B. Professional Societies as a Resource for Career Education and Sex Equity

Almost any career area well-represented in a community will have its own professional society. Professional societies are a extremely valuable resources for providing technical career information. They are a source of active career experts currently employed in science and engineering careers. The mission of professional societies is to provide career development information both for members and for potentially interested students, and many societies have special programs to assist teachers K-12 in familiarizing students with career opportunities. These programs include contests and awards for outstanding students, career workshops for students and parents, in-service training programs for teachers, shadowing experiences for students, and speakers' bureau to provide role models in the classroom.

We have chosen to highlight a cross section of professional societies representative of organizations present in larger communities across the country. Most are very interested in the educational process and are actively seeking ways to be of more service to schools, teachers, and students.

SOCIETIES WITH A CAREER EDUCATION EMPHASIS

Affiliate Societies Council:

In many cities there is an umbrella organization whose membership consists of technically affiliated societies. This network may sponsor many career activities. In Dayton, it is the Affiliate Societies Council. Fifty-one technical societies belong to the Affiliate Societies Council. About half of its activities and budget are earmarked for career guidance.

Activities:

The Affiliate Societies Council cites the "Junior Achievement Skills Symposiums" as an example of its efforts to offer career education to local students. Offered in conjunction with the Engineering and Science Foundation of Dayton, Inc., the local Junior Achievement organization, and Sinclair Community College, this yearly program attracts high school students from all over the Dayton area and utilizes local business leaders as career experts. During the Junior Achievement Skills Symposium, students learn about the skills required for such positions as company administrator, marketing representative, manufacturing and quality control manager, or product development specialist.

Member professional societies of the Affiliate Societies Council also participate in the statewide "Engineer and Scientist for a Day" program in which 1,700 students from 250 schools across the state spend a day interacting with a practicing scientist or engineer. This program was initiated by the Engineers' Foundation of Ohio, the educational arm of the Ohio Society of Professional Engineers. The Foundation distributes a wide variety of information on engineering and technological careers, and spon-

sors leadership labs, engineering/science summer schools, and a scholarship sharing plan with colleges and universities across the state.

In addition to career education activities, organizations like the Affiliate Societies Council also maintain speakers' bureaus which can provide schools and community groups with experts from a variety of professional areas.

For more information about the Engineers Foundation of Ohio or the Affiliate Societies Council, contact these sources:

Ms. Mary Horen
Engineers Foundation of Ohio, Inc.
445 King Avenue
Columbus, Ohio 43201
(614)424-6645

Affiliate Societies Council
140 East Monument Avenue
Dayton, Ohio 45402

To locate professionals for career education programs, check with any technical society, local Chamber of Commerce, the head of any college technical department (electrical engineering, industrial engineering technology, quality control, etc.), or the appropriate professional society index at a local public or university library.

Association of Women in Science (AWIS)

This national organization currently has two Ohio chapters in Columbus and Dayton. Its major emphasis is to encourage women to pursue and advance in science and technical fields and to keep young women from feeling that science is closed to them. Members are from the physical, life, social, and health sciences and represent a wide spectrum of science employers and career options.

AWIS chapters can provide women speakers/role models representing most science careers and can be the entry point for arranging tours of industrial facilities in chemical plants, research and design organizations, and academic organizations.

At the national level AWIS maintains a registry for women in science and engineering. All women in science, medicine, and engineering are eligible to be listed in this data base. The registry is searched on a regular basis to locate qualified candidates for jobs and advisory panels. It also provides speakers and resource persons for journalists and conference planners. An individual need not be actively seeking employment in order to be included in the registry.

Those wishing to be listed or to use the registry for recruitment should write to:

Mary Lee Schneiders
National Registry of Women in Science and Engineering
1346 Connecticut Avenue, NW
Suite 1122
Washington, D.C. 21136
(202)833-1998

For more information on AWIS chapters contact:

National: AWIS
Suite 1122
1346 Connecticut Avenue, N.W.
Washington, D.C. 20036

Columbus: AWISCO (Central Ohio)
P.O. Box 02145
Columbus, OH 43202

Dayton: DAWIS (Dayton AWIS)
c/o Affiliate Societies Council of Dayton
140 East Monument Avenue
Dayton, OH 45402
(513)224-8513

Society of Women Engineers (SWE)

This national organization for women engineers has state and regional chapters and an organization for members-at-large. The society encourages young women to enter engineering. It also serves to facilitate the social as well as the professional networking of women engineers. Student SWE chapters exist at most colleges with engineering programs. The national SWE organization works closely with the student chapters to disseminate career information to college students.

To determine the type of career guidance typical of SWE sections, we surveyed the activities of the southwestern Ohio section of the Society of Women Engineers. In summary, SWE:

- o Presents Certificates of Merit to outstanding female high school science students. All high schools are eligible to nominate students for this program.
- o Provides speakers/role models to make individual or group presentations through panel discussions.
- o Provides commentators for audiovisual presentations developed by industry to increase awareness about opportunities in engineering. Example: Bell Systems High School Program.

- o Conducts workshops and other activities to familiarize students, parents, teachers, and counselors with engineering careers, curriculum preparation, and financial aid information.
- o Participates in such industry-sponsored programs as "Engineer for a Day", in which students can gain first-hand information about engineering by shadowing an engineer at work.

Parenthetically, since engineering has only recently begun to attract larger numbers of women, most female engineers are just out of college. They may not yet have had to practice the balancing act required of professional women who are also wives and mothers. This "balancing act" is of great concern to high school women considering demanding careers and raises many questions for which there are no easy answers. Enlisting the help of an organization such as SWE can locate women who are successfully combining marriage, career, and parenthood, women who can speak from experience to the concerns of career-oriented students.

The addresses of national and regional SWE offices follow:

National:

Headquarters:

Society of Women Engineers
United Engineering Center, Room 305
345 East 47th Street
New York, NY 10017
(212)705-7855

Student Chapters:

SWE
College of Engineering
Ohio State University
Columbus, OH 43210

SWE
Stidwell Hall, Room 306
Cleveland State University
Cleveland, OH 44115

SWE
215 Crawford Hall
Case Western Reserve Univ.
Cleveland, OH 44106

SWE
Youngstown State University
410 Wick Avenue
Youngstown, OH 44555

SWE
Baldwin Hall, ML #18
University of Cincinnati
Cincinnati, OH 45221

SWE
Engineering Building
Ohio University
Athens, OH 45701

SWE
School of Engineering
University of Dayton
Dayton, OH 45469

GETTING THE MOST FROM CONTACTS WITH PROFESSIONAL ORGANIZATIONS

One of the most frequent reasons for contacting a professional society will be to utilize members as presenters during a career education day or as role models to demonstrate some of the sociological factors in combining career and family obligations. The following suggestions indicate how to best use contacts with professional organizations.

- o Allow plenty of lead time; setting up a program with a professional society may require several contacts to complete all arrangements and to get all the necessary information from the society to the school.
- o Speakers invited to the school should be given demographic information about the students they will be speaking to: sex, size of group, age, science backgrounds, intellectual performance, and aspirational levels of the students, and

economic and academic backgrounds of their families.

- o Teachers can enlarge upon the presentations of the speakers by providing supplemental handouts to students and providing information to students and parents about courses students should take in junior/senior high to pursue science/technical careers.
- o Be sure to ask whether the speaker will need any audio-visual equipment and, if so, check it out and make sure it is in good working order before the speaker arrives.
- o Information on how to reach the school, where to park, and how to reach the classroom will make the speaker's job easier.
- o Don't expect speakers to provide handout materials or to remain after their allotted time for individual consultations with students or teachers unless these points were carefully worked out ahead of time.
- o Do provide feedback to the sponsoring society on how effective the participation was, what the strong points were, and what could be helpful another time.
- o Remember that many societies are trying to serve students and are trying to discover efficient and effective ways to do this. Use them!

C. Computer Files on Career Information

The Ohio Board of Regents also developed the Ohio Career Information System (OCIS), a unique computer-based information system with files on national occupations, (both civilian and military); state occupations (those most representative of Ohio's major work force); two- and four-year colleges, nationwide; graduate sources of scholarships and financial aid, both national and those specific to Ohio; additional career resources; information concerning the "World of Work"; and labor market information and economic data for the major metropolitan areas of Cleveland, Columbus, Toledo, Dayton, Cincinnati and Akron/Canton. The Health Career Opportunity Programs have recently been added to the OCIS files to list the Registered Nursing (RN) and Licensed Practical Nursing (LPN) training programs in Ohio. Also included is the HELP information file which provides suggestions about looking for a job, expectations as one begins a new job, and definitions of terms and titles in particular job classifications.

The terminal-based system (OCIS) is now available in more than 80% of Ohio's junior and senior high schools with access through guidance offices. Most of the state's large high schools and many of its community colleges have on site terminal access for student use but often the smaller schools use either a telephone access or a link system. Currently, the schools absorb the cost of the service. Plans are to involve 90% of Ohio's schools by 1985. The Ohio Department of Education will provide specific details to anyone wishing to implement a similar program within a school system. Additional information can be obtained by contacting:

Anne Wilson
User Representative
Ohio Career Information System
Rm. 902
65 S. Front St.
Columbus, Ohio 43215
(614) 462-6771

G. James Pinchak, Ph.D.
Information Development Supervisor
Ohio Career Information System
Rm. 902
65 S. Front St.
Columbus, Ohio 43215
(614) 462-6771

Following is a brief explanation of the information available in each of the files:

o THE OHIO OCCUPATIONAL INFORMATION FILE (SOCC)

Contains information on more than 300 occupations that represent the majority of Ohio's work force. Items includes a general definition of the occupation, duties or task performed; tools or equipment used; potential areas of employment with advancement potential; benefits and hiring practices when applicable; employment outlook information; a listing of sources to contact for further information; and a cross reference to the appropriate training file.

o THE NATIONAL OCCUPATIONAL INFORMATION FILE (OCCU)

Contains information on approximately 850 occupations that represent the work force nationwide. Included is much the same type of information as in the SOCC file, but nationwide in scope.

o THE ARMED SERVICES OCCUPATIONS SECTION

Provides basic information about more than 100 occupations in the Armed Services. For each occupation there is a general description, a list of military occupations, and a list of related civilian occupations.

o CAREER RESOURCES FILE (CRES)

Contains additional sources of information for each Ohio occupation (SOCC) such as national professional associations, publications, and educational institutions.

o REGIONAL ECONOMIC DATA

Contains information specific to the major metropolitan areas in Ohio concerning wages and salaries, employment outlooks, and the number of job openings.

o THE FOUR-YEAR COLLEGE FILE (COL4)

Contains information concerning more than 1,500 colleges and universities across the country, including geographic location, size of student body, available majors, national test scores, costs, and various aspects of campus life. The information found in the COL4 file is supplied by the colleges and is updated each year.

o THE TWO-YEAR COLLEGE FILE (COL2)

Contains information about more than 1,200 two-year colleges and technical institutions in the country, including program offerings, geographic location, size of student body, costs, and campus life. The information found in the COL2 file is supplied by the colleges and is updated each year.

o THE GRADUATE SCHOOL INFORMATION FILE (GRAD)

Contains information on hundreds of graduate school programs nationwide. Information is available about graduate programs, degree requirements, financial aid, placement, etc.

o THE OHIO PROPRIETARY SCHOOL FILE (PROP)

Provides information regarding private, postsecondary schools throughout Ohio. Data include programs of study, tuition, length of program, average enrollment, special resources for the handicapped, and people to contact for additional information.

o THE HEALTH CAREER OPPORTUNITY FILE (HCOP)

Contains information about careers in nursing in Ohio including prerequisites for classes, training programs, and school accreditation.

o THE OHIO VOCATIONAL PROGRAM INFORMATION FILE (VOCA)

Contains information about nearly 600 state-assisted vocational programs in Ohio including hospital training programs. This file will be expanded to include all types of vocational education.

o THE OHIO FINANCIAL AID AND SCHOLARSHIP FILE (SAID)

Provides information on scholarships and financial aid programs specific to Ohio. Information includes definitions and descriptions of various types of aid (including loans, grants, and scholarships); how to apply for state aid; requirements; and places to write for more information.

o THE NATIONAL FINANCIAL AID INFORMATION FILE (AIDS)

Contains information about national scholarship and financial aid programs worth millions of dollars. Lists financial aid, eligibility requirements, application deadlines, and addresses for more information.

o INFORMATION OF THE WORLD OF WORK (INFO)

Answers questions pertaining to being a member of Ohio's work force. Included is information on "choosing your field," "beginning a new job," "unemployment insurance," etc. OCIS now includes a file on adult education and training as well.

OTHER NATIONWIDE RESOURCES

The Council for the Advancement of Experiential Learning (CAEL)
Call Monday-Friday, 9 AM to 9 PM (EST), 800-638-7813. This is a national toll-free number that provides information about educational opportunities for adults entering or returning to college and ways to gain credit for life experience.

Women USA Hot Line. For concise and up-to-date information on women's issues and suggested actions to take, call toll-free 800-221-4945.

D. The Community College and Career Education: Dayton's Sinclair Community College as a Model

General Description

Meeting the needs of community members is the basic mission of community colleges; therefore, high school science and mathematics teachers should consider them excellent resources for providing career education. This educational mission sensitizes community colleges to the needs of those students who are uncertain about their educational and vocational goals. The same mission also makes community college faculty and administration aware of being a part of the business and industrial community. As administrators of tax-supported educational institutions, they believe they have a mandate to translate the current needs of business and industry into educational programs. In short, those involved in career education should realize that the community college can function as a "port of entry" into the world of work. Within the structure of diversified course offerings at community colleges, students can better understand their career goals and prove themselves academically.

Dayton's Sinclair Community College serves as a "role model" for using a community college as a resource for providing sex- and race-equitable career information. The information in this section was generated in a "brainstorming" session with Sinclair faculty and administration. The session began with a question to Sinclair president, Dr. David Ponitz, about how Sinclair might serve as a learning extension for science and mathematics teachers who want to utilize the resources of a community college. President Ponitz replied, "One of Sinclair's major functions is to provide guidance and counseling services to assist students in making appropriate academic and vocational decisions toward fulfillment of their needs and goals. This goal closely aligns the mission of Sinclair with the challenge high school teachers are now facing in incorporating sex- and race-equitable career education in their classrooms."

Dr. Ponitz pointed out that the community college curriculum is already organized around career areas. For example there are educational degree programs in Allied Health, Business and Industrial Management, Public Service, Engineering and Industrial Technologies, and Fine and Performing Arts. The curricular emphasis by community colleges, which concentrates on preparing students for careers, has resulted in acquiring the most advanced equipment—equipment crucial for instruction in applied areas and a vital component in a real life "hands-on" link to career education within an educational program. This type of equipment is often not found in other educational institutions.

To approach a community college for assistance in helping meet students' career education needs, first contact the Vice President for Academic Affairs or the dean of the academic area of interest. A successful program, however, must receive the cooperation and support of both community college and high school faculties. A set of educational modules designed by Sinclair faculty are presented as examples of what is possible when community college and high school faculty work together on a career education program. The career areas represented here, engineering

technology, allied health, and business and computer technology, are those available at Sinclair; another community college may offer other possibilities. Any community college faculty members will undoubtedly be as enthusiastic about ideas for enhancing career education goals as were the Sinclair faculty.

Community College Program Modules

Engineering Technology Modules

In planning career education components, engineering technology divisions have the advantage of being able to provide equipment that can help your students understand non-traditional career areas. The Sinclair Engineering Technology faculty-designed hypothetical student interaction programs illustrate the creativity and technical expertise that can be found within a typical community college faculty group. These modules were designed specifically for high school students and can be presented in a 60-90 minute period. Science and mathematics teachers who can arrange more than an hour and a half for students to participate in an engineering technology module may wish to link more than one module together for a single class visit.

Packaging An Egg

Packaging is familiar territory to all of us. Different types of packaging are encountered in almost all areas of consumer interest: food products, cosmetics, pharmaceuticals, etc. Packaging also contributes heavily to our economy as it makes possible product distribution to various parts of the world. Sinclair faculty members capitalized on this familiarity and economic importance when they suggested packaging as a mechanism for demonstrating the laws of physics, gravity, G forces, and vibration. High school students can be introduced to these laws through demonstrations of shock and vibration impact testing on different forms of packaging. To accomplish this objective, students are assigned the problem of designing a package out of corrugated material in order to enable an egg to withstand a drop equivalent to two or more stories. The students design and construct the package for an egg, then drop the egg from the second story of a building. This demonstration compares the results of dropping an egg without packaging to the shock and impact it can withstand when packaged.

Non-Destructive Testing

In this module, students learn the basic laws of physics and their relation to non-destructive testing by illustrating how the human senses can be assisted in finding discrepancies or cracks in the construction of materials. The instructors relate the area of non-destructive testing to the world we live in by asking students to find surface cracks in a familiar material using a liquid penetrant. Students learn that these same techniques were used to find surface cracks in the DC-10 pylons after they failed to support DC-10 engines, causing a tragic plane crash near Chicago in 1979. The test is conducted by allowing the liquid penetrant to seep into allegedly defective material, then wiping it off and using a developer

to identify fissures or cracks with ultra violet radiation. Fissures or cracks which cannot be seen by the human eye are detectable with ultra-violet light, because of the phosphorescent properties of the developer.

Energy Conservation

The energy conservation module allows students to use equipment which illustrates energy conservation and its relation to heat pumps, solar energy, refrigeration, and air conditioning. Use of laboratory equipment allows students to evacuate a refrigeration system and charge that system with freon. The student becomes familiar with air conditioning and heat pump units and the facets of a solar energy system. The energy simulator can be artificially set to malfunction in a particular way--no heat, no water circulation, etc. The student is given the trouble-shooting problem of diagnosing the system and of determining what changes can be made to fix it. This experience permits students to understand more economical utilization of energy, the function of air conditioning and heat pump units, as well as some trouble shooting procedures for heating, air conditioning, and solar units.

Digital Concepts

Sinclair's engineering electronic technology faculty suggest introducing students to the exciting, rapidly changing area of electronics through a digital concepts module. Students are first introduced to Boolean algebra and to basic logic circuits through an introduction to the binary number system (0,1). Students learn that the binary system of 0 and 1 refers to switches being either off or on--thus relating the system to electronics. Finally, students become familiar with circuits and their applications by building logic circuits and counters.

The Diesel Engine Module

High school science and math teachers concerned with sex equity and the historic cultural differences that have caused women to shy away from nontraditional career fields will be very happy with the proposed diesel engine module. In this module, up to ten students can go through a four-hour, hands-on lecture and laboratory learning activity that provides background information on the theory and application of diesel engines. Students learn the basic differences between diesel and non-diesel engines and the distinction between compression and spark ignition. Students use a dynamometer to test and compare the mechanical outputs of a diesel engine when different fuels are used, and take torque measurements to calculate horsepower. The energy output of a #2 diesel engine fuel is compared mathematically to the energy output when using a substitute fuel. The British Thermal Unit (BTU) is the unit of measurement. The horsepower outputs of the engines are compared using the same two fuels, indicating a greater energy output for the #2 fuel. This module has added appeal because the concepts introduced relate to mathematics and chemistry already familiar to the student.

Allied Health Care Modules

Students who are interested in the human services career fields may find an introduction to the health sciences to their liking. Two-year associate degree programs in many health career specialties are available at community colleges across the nation for students who wish to become health care professionals. To provide a brief acquaintance with this career area, the Allied Health Division of Sinclair designed modules that introduce high school students to the rapidly expanding field of health practices and care.

Physical Therapy Module

The Physical Therapist Assistant Program faculty members introduce high school students to this profession, which deals extensively with physical rehabilitation, by actively involving them in the procedures that physical therapist assistants employ in the treatment of patients. High school students are often "turned on" to this career area by learning through simulation experiences what it feels like to be the victim of a crippling physical condition. Mock-up situations in which students participate include manipulation of a wheelchair, approximation of an amputation through appendage restriction, and awareness of hearing and vision impairment through the use of earplugs, blindfolds, or severely-obscured eyeglasses.

Many students may already be painfully familiar with sports injuries and the various recommended treatment modes. In this introduction to physical therapy, students learn about the use of water (e.g., in a whirlpool bath), as well as applied heat and/or cold, for therapeutic purposes. They also gain an appreciation for high-energy/low voltage diathermy treatments ("diathermy" means to "warm through" with small amounts of electricity) which increases circulation to injured body parts. Participants in this module, under staff supervision, practice with hot and cold pack treatments and take part in demonstrations of the diathermy equipment, while a faculty member explains how these treatments physically affect specific muscles and joints.

To learn about one of the recommended treatments for arthritis, student participants immerse a hand or foot in a "paraffin wax bath" which increases circulation to arthritically inflamed joints with constant, penetrating heat. Students also learn the contributing causes of this condition.

Health Skills Module

Nursing is a field recently given much attention by the media, and nationwide shortages have made this profession a career choice worth consideration by both men and women. In the Nursing Health Skills module, faculty members introduce high school students to some basic skills and concepts, including the technique of "taking" blood pressure and the difference between systolic and diastolic pressures; the meaning (in terms of patient health) of high and low blood pressures; and the use of electrocardiography (EKG) in diagnosing heart malfunctions. Also included in this exercise are traction techniques, purposes of traction, methods of

relocating a bedridden patient, and procedures to stop a choking person from suffocating.

Community colleges offering nursing programs are equipped with practice labs which simulate the hospital environment and include beds and various types of monitoring equipment. This type of lab facility enhances a career exploration experience by enabling high school students to actually practice some of the techniques about which they have just learned. Some of these procedures include taking pulses by hand with a watch and stethoscope and "hands on" experience of how to use a blood pressure indicator by practicing on classmates.

In this module students also have the opportunity to set up and read an EKG, put a student in traction to learn why this procedure works, and practice moving a bedridden classmate. Finally, students practice the "Heimlich maneuver," a life-saving procedure which forces an obstruction caught in the windpipe out through the mouth. For this activity, a mannequin called "Chokin' Charlie" is used.

Surgical Technology Module

For many persons interested in the health care field, surgical technology offers a challenging career. Technologists employed in this area set up and make available the equipment and instruments used to assist surgeons and other members of the surgical team in the operating room.

This educational experience permits students to participate in a mock surgery. Students are also given a brief introduction to anesthesia and the anesthesia machine. (Although surgical technologists must be familiar with this machine, only skilled anesthesiologists may operate it.)

Community colleges that provide surgical technology as a career education offering must have a laboratory available which simulates the operating room environment and which includes instruments, equipment, and a surgical patient mannequin upon which basic surgical support procedures can be practiced. Sinclair, for example, utilizes a mannequin with an abdominal "window" of clear plastic which approximates the many layers of human skin. During mock surgical situations the instructor demonstrates an incision into the body cavity to enable students to learn the use and function of a wide variety of regular surgical instruments such as scalpels, hemostats, forceps, clamps, and retractors, as well as many other essential tools for specialized surgical procedures.

Business and Computer Technology Module

Classroom teachers interested in providing students with effective nonsexist career education in the business and computer fields can also utilize the resources of a community college. Community colleges have, by necessity, developed very close working relationships with business and industry and are on the "cutting edge" of the new trends affecting employability.

The following module shows how to put this "cutting edge" to use in the areas of business and computer technology.

Computer Literacy: Real-Life Applications for Science and
Math Students

While the growth of computer technology in all areas of business and industry is common knowledge, many high school students are unaware of the fundamentals of this technology and are in awe of it as a career possibility. In this module community college students from the computer technology program conduct a computer literacy program under the direction of faculty members with emphasis on the real-life applications of computer science.

An initial session conducted by second-year computer science students and laboratory assistants provides an introduction to the fundamental concepts of the computer and a language such as BASIC. As a wrap-up to the introductory session, students are shown how to operate individual computer terminals and encouraged to develop a simple program on the computer to solve a simulated problem.

In a follow-up session, demonstrations of computer programming and systems operation are presented to illustrate the use of computer technology to solve the problems often encountered in industry.

In all of the described modules--Engineering Technology, Energy Conservation, Digital Concepts, Diesel Engine Mechanics, Surgical Technology, and Business and Computer Technology--Sinclair Community College administrators and faculty members demonstrate ways community college resources can productively be put to use by high school science and mathematics teachers. The "career area" organization of most community college programs is ready-made to provide supplements to enhance high school subjects. Consider using a local community college's personnel and physical resources. Your students will be enriched.

A TOTAL CAREER EDUCATION MODEL: THE DAYTON CAREER ACADEMY

"Make each one of our schools an embryonic community life, active with types of occupations that reflect the life of the larger society, and permeated throughout with the spirit of art, history, and science."

John Dewey



More than 80 years have passed since the philosopher Dewey set forth his theories of education, theories which referred to schools as microcosmic reflections of and preparation for the world around them. Throughout those 80 years, school systems in America have been making modest progress toward Dewey's ideal. Now a secondary school in Dayton, Ohio, dedicated to his philosophy, is attracting attention from administrators, educational planners, teachers, and counselors throughout the world. Called the Dayton Career Academy, it is a unique model in its approach to career education because it attempts to provide a bridge from the classroom to the community and to reflect a sex equitable approach to employment in its course offerings and to illustrate that work in the community is done by both men and women. The Career Academy provides the benefits of both vocational and college preparation to a diverse student body aiming for widely varying careers.

The Academy can accomplish this complete preparation by offering two "clusters" of curricula designed to suit the individual needs of its students: 1) cluster I—five "pre-professional" programs for college-bound students interested in business administration, engineering and science, health and medicine, music, and social sciences; and 2) cluster II—eight vocational programs in banking and finance, biomedical equipment electronics, diesel/heavy equipment mechanics, interior design, industrial laboratory assistance, law enforcement, legal/medical secretarial sciences, and pharmacy assistance.

Planning for the \$6.2 million facility began in 1977 as an outgrowth of the desire of educators and parents to increase students' exposure to career-related issues during their high school years. Federal, state, and local funds financed the building; the city of Dayton donated the site; school personnel developed the curricula; teachers and counselors were

recruited from the Dayton School System; and in 1981 the Dayton Career Academy opened its doors to more than 300 students.

The design of the building itself suggests the goals of its students. It could be mistaken for a modern office building or a health care facility, an industry headquarters or an expensive hotel, as it dominates a section on the bank of Dayton's Miami River. Contemporary architecture and formal landscaping contribute to the non-academic illusion, as does the absence of such "schoolish" accoutrements as football field and gymnasium.

Inside, the ambience of the workplace is even more evident. Expansive windows reveal spectacular views of the river or of nearby downtown Dayton. Carpeted halls (complete with piped-in music), attractive wall coverings, and vibrant color schemes could rival those of any new office complex. There are no bells between classes, no restroom passes; the corridors are conspicuously free of the debris and graffiti that clutter up so many high school hallways.

But these surface niceties would be only so much fluff if the facilities were not equipped well enough to support the image. In the Dayton Career Academy, such is not the case. The business labs are replete with up-to-date office machines, including the latest word- and data-processing equipment; students in the diesel/heavy equipment mechanics program learn on the same engines found in trucks and farm equipment; those enrolled in the biomedical equipment electronics program are trained to maintain and repair the same kinds of medical equipment used in modern health facilities. The Academy also features a lab equipped with a host of work stations designed to expose the students to careers ranging from CRT operators to industrial machinists. At each station students perform a series of operations toward a completed task and fill out a questionnaire designed to assess their interest in and aptitude for the various careers thus simulated.

Students enter the Career Academy in their junior year, but retain close ties with the "home schools" from which they come. Those who are enrolled in the pre-professional programs take specialized classes in the mornings, returning to their home schools for general studies in the afternoons. Those in the vocational programs remain at the Academy for the entire day. All students are required, however, to complete (in addition to the general requirements of the freshman and sophomore years), a third year of English, a year of American history and a year of Civics/Social Problems. Upon graduation, students receive diplomas from their home schools, not from the Academy.

In its first year, the Career Academy attracted visitors from as far away as Canada and Japan who wanted to examine the programs of this unusual school—reputed to be the only one of its kind in the United States. The students now enrolled don't seem to mind completing their high school education in a fishbowl of sorts. In fact, all the members in a small group of Academy students recently surveyed believed they were learning more at the Career Academy than they were at their own high schools. "It just seems like there's more atmosphere for learning here," one young woman said. "At my home school people get rowdy in classes. You have to want to come here, or you get kicked out."

Although many Career Academy students find their loyalties divided between Academy and home school, there are some who, wishing to be identified more with the Academy, would like to see it offer intramural athletics and grant diplomas.

Now the students thrive with the individual attention and concern they say the Academy teachers are better able to provide. And they bask in their new-found freedom. "We have a more college-like environment," said a young man. "You're more free; you're not restricted. You don't have to have a pass to go here, a pass to go there, raise your hand to do this . . ." One handicapped student told how, when a friend helped walk her to her bus in the middle of the day, a faculty member asked her friend where he was going. "He said, 'I'm walking Chris to the bus.' (The teacher didn't mind.) And you know, if you were to do that in a regular school . . . they'd say, 'Close the gates, he's trying to escape!'" laughed her friend.

The enthusiastic reports from the Academy's first class provide an insight to the vital function the Career Academy is serving: an integrated and planned approach to incorporating sex equitable career education into the curriculum and an example to school systems world-wide that career education can be provided to all students without sacrificing the quality of general education.

It is not clear, however, whether the Career Academy model will be unanimously accepted by educators or duplicated in other parts of the country. The development or potential development of some career academies cannot replace the interest, enthusiasm, and dedication of basic, general, and specialized teachers in their efforts to incorporate career education routinely into classroom presentations.

A review of the curriculum design of a typical career academy program is included to illustrate the philosophy of the career academy. Students take courses around a central career theme at the Academy and more general courses in liberal arts, math, and science at their home schools. In the adoption of a career academy program, three points are worth considering:

1. The career academy model offers the benefits of centralized planning and cost effective utilization of expensive equipment such as computers and diesel engine laboratories.
2. The career academy must meet the challenge neither to dichotomize the students' concepts of education and career education nor to divorce career planning from career education which should involve the students' home schools.
3. An academy that fosters and emphasizes career education as part of its mission automatically reduces barriers to nontraditional careers for women. Women are more apt to enroll in diesel technology in the career academy where "that's the thing to do." In their home high school diesel technology might not be offered or taking it might attract too much peer disapproval.

The sample programs are listed here to encourage imitation and/or adaptation. Even though some of the freshmen and sophomore requirements

differ among disciplines, the overall program is essentially the same for all program concentrations. A sample of home school prerequisites describes a typical program of study for business or engineering and science.

SAMPLE OF HOME SCHOOL PREREQUISITES:

Freshman Required Courses:

English I
Math I
Science
Health
Physical Education

Sophomore Required Courses:

English II
Physical Education

Suggested Electives (Minimum 4):

Math II
Foreign Language I, II
Science
Social Science

Art
Home Economics
Industrial Arts
Music

Computer Science
Typing
Speech

BUSINESS ADMINISTRATION

This two-year program is for students who wish to begin preparing for administrative positions in business, government, non-profit organizations and industry. It offers pre-college courses which introduce students to the world of business, industry, and government. Students will develop attitudes and appreciations that make advancement possible. Choosing appropriate electives and completing this program will prepare students to enter college, university, or technical school.

ACADEMY PROGRAM OF STUDY:

Junior Required Courses:

<i>Cluster Block</i>	
<i>Accounting I</i>	<i>1 > Cr</i>
<i>Introduction to Business</i>	<i>1 > Cr</i>
<i>Business Law or Business Communications</i>	<i><u>1 > Cr</u></i>
<i>Total</i>	<i>4 > Cr</i>

*American History
English III*

Senior Required Courses:

<i>Cluster Block</i>	
<i>Accounting II</i>	<i>1 > Cr</i>
<i>Business Principles and Management</i>	<i>1 > Cr</i>
<i>Principles of Economics</i>	<i><u>1 > Cr</u></i>
<i>Total</i>	<i>4 > Cr</i>

Civics/Social Problems

Suggested Electives:

Home School:

*Math III
Science
Home Economics
Music*

*Computer Science
Art
Industrial Arts*

Academy:

*Humanities
Foreign Language III, IV*

*Advanced English
Urban Studies*

ENGINEERING AND SCIENCE

The Engineering and Science program is for students who want a strong pre-college background in chemistry, physics, mathematics, and drafting. These courses along with appropriate electives are required for admission to science and engineering programs in colleges, universities, and advanced technical schools.

ACADEMY PROGRAM OF STUDY:

Junior

Required Courses:

Cluster Block

<i>Chemistry II</i>	<i>1 Cr</i>
<i>Math III or IV</i>	<i>1 Cr</i>
<i>Physics I</i>	<i>1 Cr</i>
<i>Drafting II</i>	<i><u>3/4 Cr</u></i>
<i>Total</i>	<i>3 3/4 Cr</i>

American History
English III

Suggested Electives:

Home School:
Art

Senior

Required Courses:

Cluster Block

<i>Physics II</i>	<i>1 Cr</i>
<i>Math IV or V</i>	<i>1 Cr</i>
<i>Advanced Chemistry</i>	<i>1 Cr</i>
<i>Advanced Drafting</i>	<i><u>3/4 Cr</u></i>
<i>Total</i>	<i>3 3/4 Cr</i>

Civics/Social Problems

Music

Academy:
Foreign Language III, IV
Humanities
Advanced English
Urban Studies

HEALTH AND MEDICINE

This two-year program includes classes in advanced science and mathematics. Students watch and talk with people in health careers and take part in activities related to work in health and medicine. This program and appropriate elective subjects prepare students for admission to colleges, universities, or technical schools.

ACADEMY PROGRAM OF STUDY:

Junior

Required Courses:

<i>Cluster Block</i>	
<i>Human Biology</i>	1 Cr
<i>Chemistry II or</i>	
<i>Physics I</i>	1 Cr
<i>Health Careers</i>	< Cr
<i>Behavioral Sci.</i>	> Cr
<i>Math III</i>	<u>1 Cr</u>
<i>Total</i>	3 3/4 Cr

American History/Studies
English III

Senior

Required Courses:

<i>Cluster Block</i>	
<i>Adv. Human Biology</i>	1 Cr
<i>Communications</i>	1 Cr
<i>Community Based</i>	
<i>Experience</i>	3/4 Cr
<i>Math IV</i>	<u>1 Cr</u>
<i>Total</i>	3 3/4 Cr

Civics/Social Problems

Suggested Electives:

Home School:

Academy:

Foreign Language III, IV
Independent Study in Health/Medicine

BIOMEDICAL EQUIPMENT ELECTRONICS

Students who enter the Biomedical Equipment Electronics program are trained to maintain and repair delicate medical equipment which is now in use in virtually all departments of modern health care facilities. Students who enter this program should show aptitude in electronics and math. Students study principles of physics such as electricity, electronics, mechanics, hydraulics, sonics, optics, and X-ray. They also study human anatomy and medical terminology and apply mechanical, biophysical, and electronics theory and techniques to biomedical instrumentation and equipment. Qualified seniors may be placed in a work/study program during the second semester.

Biomedical Electronics graduates find employment in hospitals or clinics where biomedical equipment is used, or with manufacturers, or equipment sales organizations, research and development labs or other health organizations.

ACADEMY PROGRAM OF STUDY:

Junior Required Courses:

*Cluster Block
Biomedical
Electronics*

Total

*5 Cr
5 Cr*

*English III
American History*

Senior Required Courses:

*Cluster Block
Biomedical
Electronics*

Total

*5 Cr
5 Cr*

Civics/Social Problems

DIESEL/HEAVY EQUIPMENT MECHANICS

The Diesel/Heavy Equipment Mechanics program gives students a broad background in repairing and servicing diesel powered equipment. For example, students learn the history and basic knowledge of diesel engines. They study air intake and exhaust systems, engine performance analysis, and cooling, lubricating, fuel, and electrical systems. Working on actual diesel powered heavy equipment, students learn to overhaul diesel engines and to service and repair brake systems, drive line and steering systems, hydraulic systems, suspension, ventilating, and emissions control systems. Qualified seniors may be placed on a job during the second semester. Graduates of this program are prepared to find jobs as mechanics with a highway department, with a diesel engine manufacturer, or in an independent repair shop.

ACADEMY PROGRAM OF STUDY:

Junior

Required Courses:

Cluster Block

Diesel/Heavy

Equipment Mechanics

Total

5 Cr

5 Cr

English III

American History

Senior

Required Courses:

Cluster Block

Diesel/Heavy

Equipment Mechanics

Total

5 Cr

5 Cr

Civics/Social Problems

CONCLUSION: JOURNEYING TOWARD A TECHNOLOGICAL FUTURE

"The interests of the sexes are inseparably connected. We both march toward the same destiny now determinedly driven by technological forces."

Carol M. Shaw



All teachers wish for their students a fulfilling journey into adulthood. And adult fulfillment will be partly based on the selection of a rewarding career, a career that in many cases will require familiarity with technology.

We hope science and mathematics teachers are convinced of the important role they play in guiding students through career decision-making so as not to preclude the selection of technical careers.

To prepare students well for the technological future, teachers may find it helpful to see themselves as tourist guides, ready to change destinations if appropriate; and the manual as a road map ready to encourage complete and thorough career trip-planning. The manual assists teachers in the tourist guide role, first, by being a jumping-off place for career education ideas in general; and, second, by serving as a guide to important areas of background knowledge, such as career prerequisites, job demand, and technological requirements, needed to keep students up-to-date on the fluxuating world of technological sophistication.

Continue to remind yourself of the importance of science and engineering to our future. As Philip M. Boffey, science and career writer for The New York Times, reminds students, "In this age of technology, the three R's are not enough." And as teachers, you must continually reinforce this idea for students. All of your students will need to be at ease with the many predictions and facts about the need for technological literacy which should be put before them in a variety of creative ways. By the end of 1985, according to a recent industry study, computer systems, now at 730,000, will double. For the remainder of the decade, new jobs for people with computer training will exceed 600,000.

But pointing out the need for technological literacy is an easy task compared to the task of quelling the fears of some scholars that more emphasis on quantitative studies means less emphasis on the humanities. Leon Botstein, President of Bard College, answers those fears by noting that if scientists will incorporate cultural, philosophical, ethical, and political implications in their teaching, the increase in scientific literacy could further communication between scientists and non-scientists. As you use ideas in this manual, your students can be the instruments of that improvement in communication.

As Andrew Pollack points out in The New York Times annual "High Technology" supplement of March 28, 1982: "Sooner or later, many experts think, most of us will have careers that involve high technology. Even those who don't design microcircuits or genetically manipulate bacteria will be working with computers or robots in their offices and factories. There will be extensive retraining for entry into new fields or adapting to computers—which will become as commonplace as telephones."

This manual suggests some ways to inform students; your own perceptions, experiences, and knowledge will lead you to other ways. Whatever ways are chosen, adolescent psychology reminds us that teachers must repeat information frequently and variously if students are to remember it and put it to good use in their lives. So, the master teacher's motto of "tell 'em what you're gonna' tell 'em, tell 'em, and then tell 'em what you've told 'em" is still good advice. To aid you in "telling 'em what you've told 'em," the last section of this manual is a bibliography with space for you to add your own entries. We urge you to continue adding to this manual, for the task of preparing students to face the technological challenges of the future is a never-ending one.

BIBLIOGRAPHY

ARTICLES

- Braudy, Susan. "Funny, You Don't Look Like An Engineer." New Engineer, March, 1973.
- Cohen, Stephen L. "The Basis of Sex-Bias in the Job Recruitment Situation." Human Resource Management, 8-10, Fall, 1976.
- Connolly, Terry and Burks, Esther Lee. "Women in Science and Engineering: Characteristics and Experiences of Established Professionals." Engineering Education, December, 1977, pp. 234-240.
- "The Corporate Woman: Up the Ladder, Finally." Business Week, p. 58, November 24, 1975.
- Durden-Smith, Jo. "Male and Female - Why?" Quest/80, Vol. 4, No. 8, October, 1980.
- Hymowitz, Carol. "More Men Infiltrating Professions Historically Dominated by Women." The Wall Street Journal. February 25, 1981.
- Kane, Rosalyn D. and Frazee, Pamela. "Occupational Choice: Do Traditional and Non-Traditional Women Differ?" (Women's Bureau of the U.S. Dept. of Labor, Washington, D.C.), 1976.
- McAlfee, Naomi J. "Women in Engineering." New Engineer, March, 1973.
- Seltz-Petrash, Ann. "Wise Words from a Woman Engineer." Graduation Engineer, 87-79 September/October 1980.
- "Woman Engineer at Work." Industrial Engineering, April, 1976.
- "Women, Minorities Underrepresented (Still!) in Engineering and Science," U.S. Woman Engineer ("Report on Science and Engineering Education"), Vol. 27, No. 4, pp. 13-14.

BOOKS

Chen, Philip S. Entertaining and Educational Chemical Demonstrations. Camarillo, CA: Chemical Elements Publishing Co., 93010.

Farris, C.J. and Amanda Smith. Expanding Adolescent Role Expectations: Information Resources, Activities for Vocational Educators. Ithaca, NY: Cornell University College of Human Ecology, 1978.

Gilbert, Lynn and Gaylen, Moore. Particular Passions. New York: Clarkson N. Potter, 1981. (Distributed by Crown 1 Park Ave., NY, 10016.) Accounts of women who made scientific contributions without recognition.

Harrigan, Betty Lehan. Games Mother Never Taught You: Corporate Gamesmanship for Women. NY: Warner Books, 1978. Orders to Independent News Co., 75 Rockefeller Plaza, New York, NY, 10019.

Ritti, R. Richard and G. Ray Funkhouser. The Ropes to Skip and the Ropes to Know. (2nd Edition) Columbus: Grid Publishing, Inc., 2950 N. High St., Box 14466, Columbus, Ohio, 43214.

Sheehy, Gail. Passages. 1st Edition. Dutton, 2 Park Ave., New York, NY, 10016, 1977.

Terkel, Studs. Working. Random House, Inc., 400 Hahn Road, Westminster, MD, 21159, 1974.

Tobias, Sheila. Overcoming Math Anxiety. NY: W.W. Norton, 1978.

DIRECTORIES

Chinn, Phyllis Zweig. Women in Science and Mathematics. A bibliography.
Humboldt State University, Arcata, CN, 95521.

"Directory of College/University Programs for Women in Engineering."
Women's Action Group, Relations with Industry, College Industry Council,
American Society for Engineering Education, 1975.

Women's Studies/1980: Selected New and Recent Books. Harper & Row
Publishers, Inc., New York, 1980. (Free)

ERIC DOCUMENTS

- Bisconti, Ann Stouffer. "Women: Marriage, Career and Job Satisfaction." (College Placement Council, Bethlehem, PA), 1978. ED 167 909, CG 013 313.
- "Counseling Women for Life Decisions." A computer search of relevant ERIC documents, November 1966 through December 1979. Available from ERIC Counseling and Personnel Services Clearinghouse, School of Education, University of Michigan, Ann Arbor, MI, 48109.
- David, Deborah Sarah. "Career Patterns and Values: A Study of Men and Women in Science and Engineering." Manpower Administration (DOL), Washington, D.C. Office of Research and Development, (BBB06018), December, 1974, ED 094 933.
- Friedlander, Jack. "Student Participation and Success in Community College Science Education Programs. September, 1981. ED 201 374.
- Hansen, L. Sunny. "Born Free: Reducing Career-Related Sex-Role Stereotyping in Educational Institutions, Staff Development and Change Process." (DOE, HEW), 1977. ED 150 493, CG 012, 160.
- "Born Free: An Applied Developmental Intervention to Reduce Career-Related Sex-Role Stereotyping in Elementary, Secondary, and Higher Education Settings." (DOE, HEW), 1977. ED 150 495, CG 012, 162.
- Keierleber, Dennis L. "Born Free: Reducing Career-Related Sex-Role Stereotyping in Educational Institutions: Process and Product Evaluation." (Office of Education, Dept. of Health, Education, and Welfare, Washington, D.C.), 1977. ED 150 494, CG 012 161.
- Levine, Maita. "Identification of Reasons Why Qualified Women Do Not Pursue Mathematical Careers." (National Science Foundation), 1976. ED 171 982, CE 021 723.
- Rose, Clare; and others. "The Study of the Academic Employment and Graduate Enrollment Patterns and Trends of Women in Science and Engineering," Final Technical Report, National Science Foundation, Washington, D.C., (FGK57295), February 1980, ED 177 016.
- Vetter, Betty M. and others. "Labor Force Participation of Women Trained in Science and Engineering and Factors Affecting Their Participation," Final Technical Report, National Science Foundation, Washington, D.C., (FGK57295), February 1980, ED 177 016.
- Vidulich, Robert N., et. al. "Career Choice and Change in High Ability Young Women," 1978. ED 162 185, CG 012, 913.

PAMPHLETS

- "The Black Female Experience in America: A Learning/Teaching Guide."
(Grant from the U.S. Dept. of Health Education and Welfare, under the auspices of the Women's Educational Equity Act), University of Tennessee, 1979. Available from the Education Development Center, 55 Chapel St., Newton, MA, 02160.
- Carvell, Fred, et. al. "Choices and Challenges—A Student Guidebook about Nontraditional Career Opportunities." First Edition, 1979.
- "From Welfare to Welding . . .: Incorporating Women into Self-supporting Occupations." A report on the Model Women's Outreach Program of the Akron Public Schools, Akron, Ohio, 1980.
- "Putting It All Together: A Model Program for Women Entering Engineering." Department of Freshman Engineering, Purdue University, 1978, W. Lafayette, IN, 47907.
- "Recruiting Women for Traditionally 'Male' Careers: Programs and Resources for Getting Women into the Men's World." Project on the Status and Education of Women, Association of American Colleges, 1818 R Street, Washington, D.C., 20009, 1977.
- Strahler, Ed.D. Violet R. and Nancy Thickett. "Dayton Career Academy." Informational Booklet/Catalog. Dayton Public Schools, 1980.
- "Understanding Sex Roles and Moving Beyond: A Learning/Teaching Guide." (Grant from the U.S. Dept. of Health, Education, and Welfare, Office of Education, under the auspices of the Women's Educational Equity Act), University of Tennessee, 1979. Available from the Education Development Center, 55 Chapel St., Newton, MA, 02160.
- "Vocational Counseling of Disadvantaged Students." A computer search of relevant ERIC documents, November 1966 through December 1979. Available from ERIC Counseling and Personnel Services Clearing House, School of Education, University of Michigan, Ann Arbor, MI, 48109.
- "Women in Engineering at the University of Washington Want to Talk With You." University of Washington, College of Engineering, Seattle, WA, 98195.

PERIODICALS/PROCEEDINGS

Aldrich, Michele L. and Hall, Paula Quick. Programs in Science, Mathematics and Engineering for Women in the United States: 1966-1978. American Association for the Advancement of Science, Washington, D.C. (1980).

Career Development Review. A quarterly publication of Career Research Institute, New York, New York, and Washington, D.C. for counselors and trainers in education, business, and government.

"Careers For Women: Why Not Be an Engineer?" Women's Bureau, Workplace Standards Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., Washington, D.C., 20210, 1971.

Engineering Manpower Bulletin. Engineering Manpower Commission of Engineers Joint Council, 345 E. 47th St., New York, NY, 10017. See especially Number 21 (May, 1972).

The Executive Female. Bi-monthly. National Association for Female Executives, Inc., New York, NY, 10022.

"Increasing the Participation of Women in Scientific Research." Summary of conference proceedings, Oct. 1977, and Research Study Project Report, March 1978, National Science Foundation, 1800 G. St., N.W., Washington, D.C., 20550.

Kreinberg, Nancy. "I'm Madly in Love with Electricity, and Other Comments about Their Work by Women in Science and Engineering." Regents: University of California, Berkeley, 1977.

Neustadt, Sara Jane. Womengineer. Engineers' Council for Professional Development, New York, NY, 10017, 1974.

Ohio Board of Regents. Ohio Educational Information Centers Network Annual Report. 30 E. Broad St., Columbus, Ohio, 43215, 1979-80.

Ott, Mary Diederick and Reese, Nancy A., eds. Women In Engineering . . . Beyond Recruitment. Proceedings of the WIE Conference, Cornell University, 1975.

"A Profile of the Woman Engineer." Society of Women Engineers, 345 E. 47th St., Room 305, New York, NY, 10017, 1980.

"Report on Women Undergraduate Engineering Students: Biennial Survey, 1959-1974." Society of Women Engineers, 345 E. 47th St., Room 305, New York, NY, 10017.

Rowe, Mary. "Go Hire Yourself a Mentor." Bourne, Patricia and Parness, Velma, eds. Proceedings of The 1977 Conference on Women's Leadership and Authority, University of California, San Francisco, 1977.

U.S. Woman Engineer. (Published 5 times/year), Society of Women Engineers, 345 E. 47th St., Room, 305, New York, NY, 10017.

Woman Engineer, The. (Published 5 times/year), Greenlawn, New York, 11740.

"Women and Minorities in Science and Engineering." National Science Foundation, 1800 G. St., N.W., Washington, D.C., 20550, 1977.

VOCATIONAL BOOKS/ARTICLES

Careers In a Plain Brown Wrapper: A Career Education Manual for Educators. Career Education Team, School of Economics, Ohio University, Athens, Ohio, 1981.

"Developing a Model for Recruitment, Retention, and Placement of Female Students in Secondary Vocational Education Programs Which Have Traditionally Been for Males." Ohio Dept. of Education, Division of Vocational Ed., Office of Sex Equity, 1979.

"Dial-a-Career Consultant." Ohio Dept. of Education, Division of Vocational Education, Office of Sex Equity, June, 1979.

Expanding Adolescent Role Expectations: Information. Activities. Resources for Vocational Educators, 1978. Community Service Education Dept., NY State College of Human Ecology, Cornell University, Ithaca, NY, 14853.

"Guide for Occupational Exploration." Bureau of Labor Statistics, U.S. Dept. of Labor, U.S. Government Printing Office, Washington, D.C., 1979.

Handbook of Trade and Technical Careers and Training. National Association of Trade and Technical Schools (NAJTS), 1981. Available free from NATTS, 2021 K St., NW, Washington, D.C., 20006.

"Help Someone Do What They Want to Do—Get in Touch with a Career Consultant." Tri-County Joint Vocational School Committee on Sex Equity, 1980.

Holland, John L. Making Vocational Choices: A Theory of Careers. NY: Prentice-Hall, Inc., 1973.

Lederer, Muriel. Blue Collar Jobs for Women. E.P. Dutton: 1979.

_____. If Not College What? A Guide to Career Education. Quadrangle Press, 1975.

Occupational Outlook Handbook. Bureau of Labor Statistics, U.S. Dept. of Labor, Washington, D.C.: U.S. Government Printing Office, 1980-81.

Occupational, Vocational and Career Education 1981 Catalog and Price List. Career Aids, Inc., 8950 Lurline Ave., Chatsworth, CA, 91311.

Splaver, Sarah and Messner, Julian. Your Career If You're Not Going to College. Prentice-Hall, 1971.

Tombaugh, Dorothy. Short bibliography on "Science for Handicapped Students," at end of Chapter 3.

Woman's Guide to Apprenticeship. Women's Bureau, U.S. Dept. of Labor: Washington, D.C., 1980.

"Women and Federal Jobs." Naval Construction Battalion Center (NCBC) and the Civil Engineering Laboratory, Port Hueneme, CA, 93041, 1975.

To the reader: *Your comments will help us to make this manual and any subsequent revisions as useful as possible.*

Name:

Address:

School:

Subject taught:

1. Any overall comments or suggestions?

2. Which section(s) did you find most helpful? Why?

3. Least helpful? How could it have been improved?

4. Any additions to text?

"THANK YOU TO ALL"

5. Any additions to bibliography?
6. Do you expect to be able to use any of the following ideas in your own classroom or school? If not, explain why.
- a. Career Navigation Paradigm (Chapter 4).
 - b. Panels (Chapter 5).
 - c. Attitude Assessment Instruments (Chapter 2).
 - d. Students' Career Planning Exercises (Chapter 2).
 - e. Role Model Interviews (Chapter 2).

Return to: Carol M. Shaw
Assistant Dean of Engineering
University of Dayton
300 College Park
Dayton, OH 45469